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ABSTRACT

This book is designed to help adults gain the range of math skills they need to succeed in life and work and on standardized tests, including the GED. It is expected to help students overcome math anxiety, discover math as interesting and purposeful, and develop good number sense. Lessons are organized around four strands: (1) skill lessons that present instruction and practice in math skills including computation and solving word problems; (2) tools lessons emphasizing the use of objects such as calculators or concepts such as estimation, all within real life contexts; (3) problem solving lessons that strengthen estimation and reasoning skills and help students build strategies for solving single and multi-step problems; and (4) application lessons that provide practice with realistic situations that require mathematics. (KHR)

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Math Sense

Formerly Smart Solutions

Decimals, Fractions, Ratios, and Percents

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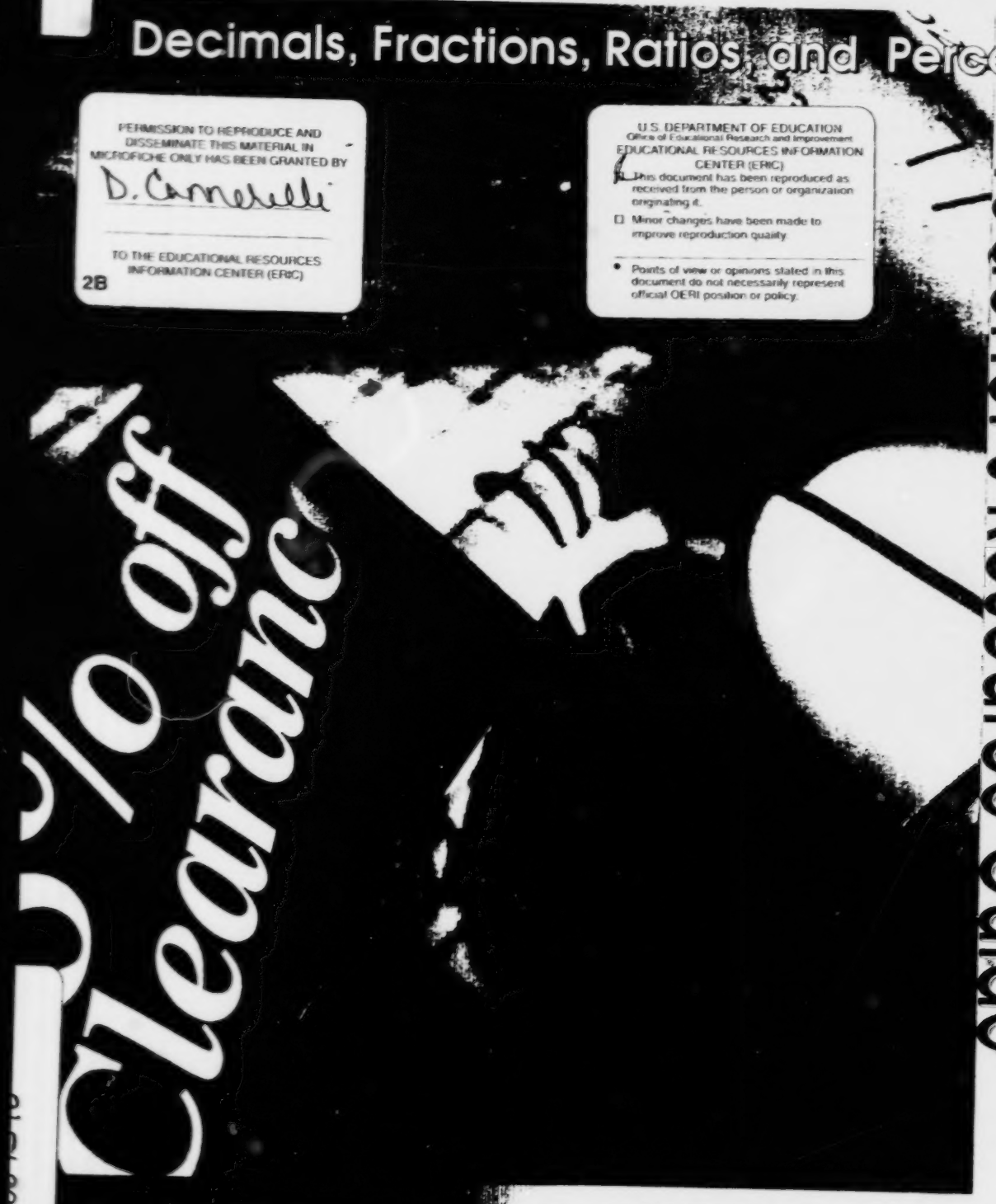

Teacher's Resource Guide

New Readers Press

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MATH SENSE

Skills, Problem Solving, Tools, and Applications

TEACHER'S RESOURCE GUIDE

Decimals, Fractions, Ratios, and Percents

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New Readers Press

Contents

Numbers Smaller Than 1 3

Decimals 12

Fractions 21

Ratio and Proportion 32

Percents 38

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1: Spinners
2: Tenths and Hundredths Grids
3: How to Get Back?
4: Fraction Figures
5: Five-Column Grids
6: Greater Than 1/2
7: Card Deck #1
8: Reimbursing a Property Manager
9: Picturing Equations #1
10: Finding the Balance
11: Decimal Weights
12: Writing Division Problems
13: Measuring Practice
14: Golden Anniversary
15: Card Deck #2
16: Mileage and Miles per Gallon
17: Clocks
18: Extra! Extra!
19: Adding Mixed Numbers
20: How Close? How Far?
21: Multiplying Fractions
22: Drawing a Picture
23: Picturing Equations #2
24: Circle Graphs
25: Writing a Ratio
26: Understanding Proportion
27: Where Are We?
28: Card Deck #3
29: Make Up the Question
30: Solving a Percent Equation
31: Making Sense of Data
32: Two-Step Percent Problems
33: Finding Discounts

Answer Key 78

Unit 1

Numbers Smaller Than 1

Unit Overview

The purpose of this unit is to introduce and explore ideas that will be expanded on in the rest of the book: writing and operating with fractions, decimals, and percents; writing and solving equations; analyzing and solving problems. Students will also use calculators and measuring tools to reinforce and apply ideas involving positive numbers smaller than 1.

When Do I Use Numbers Smaller Than 1?

page 13

Have students complete the checklist and answer the questions individually. Then, have the class discuss *how* they used small numbers in the situations they checked. Also discuss the following question: *"For what real-life skills would you need to learn about these topics?"* Indicate that there are no right and wrong answers to this question.

Talk About It page 13

Have students compare their lists with each other. If their answers differ, you may want to explore the following questions: *"Is either answer 'wrong'? Why or why not?"* Discuss whether there is always one right answer when you work with numbers.

Working Together page 47

Have students discuss what factors affect their choice of transportation. Discuss the costs of owning a car (including parking and insurance) and the need for planning when you use public transportation (making connections, reading schedules, using transfers). Using the list from question 2, ask students how much of that list is fractions, how much is decimals, and how much is percents. Then have them express those amounts in fractions, decimals, and percents.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
Understanding Decimals	14	4	Hands-On	1
Reading Decimals	16	4	Reasoning	
Writing Decimals	18	5	Communication	
Comparing Decimals	20	5	Reasoning	2
Reading Digital Measurements	22	6	Cooperative Learning	
Using Your Calculator	24	6	Cooperative Learning	3
Writing Expressions	26	7	Cooperative Learning	1
Solving Word Problems	28	7	Communication	
Understanding Fractions	30	8	Cooperative Learning	
The Size of Fractions	32	8	Reasoning	1, 2
Forms of Fractions	34	9	Hands-On	2
Equivalent Fractions	36	9	Hands-On	4
Filling in a Grid	38	10	Grid Activity	5, 6
Reading Fraction Measurements	40	10	Reasoning	
Understanding Percent	42	11	Hands-On	7
Solving Multistep Problems	44	11	Communication	

Understanding Decimals

SB p. 14

Lesson Objectives

- recognize place value names on both sides of the decimal point
- understand the value of a digit in a decimal number

Common Difficulties

When students are learning the place value names for decimals, they can become confused if they do not look at the ends of words to distinguish between *tens* and *tenths*, *hundreds* and *hundredths*, and so on.

Activity

Change a Digit

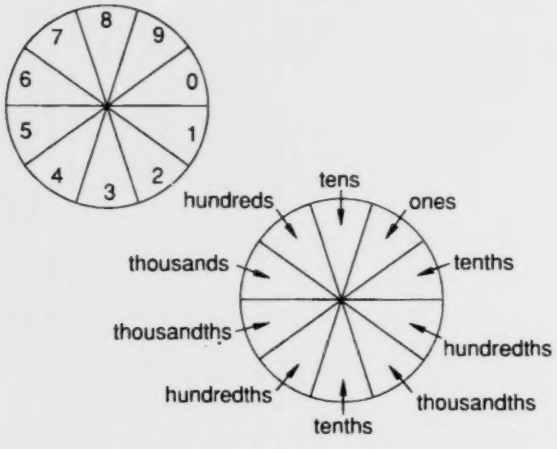
Purpose: introduce the ideas in the lesson

Materials

- PCM 1: Spinners, p. 45
- paper clips

What to Do

Students can work individually or in pairs. Distribute paper clips and two copies of PCM 1 to each student or pair. Have students label the sectors of the two 10-part spinners so they look like the following (*tenths*, *hundredths*, and *thousandths* are repeated):



Write a seven-digit number like this (from thousands to thousandths) on the board: 3,427.703

Tell students to spin the paper clip on each spinner and change a digit of the number. For example, if they get *9* and *thousandths*, they should write their new number by changing the digit in the thousandths place to 9: 3,427.709

They should continue spinning until all seven digits of their new number are different from those in the original number.

Reading Decimals

SB p. 16

Lesson Objectives

- read a decimal number correctly
- understand that a decimal has a two-part name
- read a decimal number with zero(s) following the decimal point
- write a decimal number in words

Activity

Where's the Point?

Purpose: apply the ideas in the lesson

Materials

- newspaper or magazine articles that use decimals

What to Do

Ask students to look through newspapers or magazines and bring to class some articles that contain numbers with decimals written to the tenths, hundredths, or thousandths place. As an alternative, you could supply the examples, or simply write several such decimals on the board. Ask students to practice saying each decimal.

Then write the same digits on the board, but put the decimal point in a different position. Ask students how the number has been changed, and ask them to say the new decimal number.

Have students form groups. Each group should write a four- or five-digit number. Going around the group, each student should put the decimal point in a different position in the number, and the other students in the group should say that decimal number.

What to Look For

Students should realize that only the last place value name is used when they say a decimal number.

Writing Decimals

SB p. 18

Lesson Objectives

- write a decimal number
- understand that *and* or *point* indicates a decimal point

Activity

Say It by the Numbers

Purpose: apply the ideas in the lesson

Materials

- slips of paper

What to Do

Cut sheets of paper into slips—at least one slip for each student in the class. Write a decimal number on each slip. Follow these guidelines for the numbers:

- The whole-number part should be a number from 1 to 9,999.
- The number should have decimal places to hundredths or to thousandths.
- There should be at least one zero holding a decimal place.

Distribute the slips to students. Ask each student to read her or his number aloud, using *and* to represent the decimal point. The other students should write the digits and decimal point for that number, with one student writing the number on the board. For each number, ask the class to name the place the zero is in. Then, on the board, add a zero to the right of the number and ask a student to say the new decimal number.

What to Look For

For a number like 123.056, the student saying the number aloud should say "one hundred twenty-three *and* fifty-six thousandths."

Comparing Decimals

SB p. 20

Lesson Objectives

- compare decimals by placing zeros so the decimals being compared have the same number of decimal places
- use the symbols >, <, and = with decimals

Common Difficulties

Students should know that placing a zero at the end of a decimal number does not change the number's value. For example, .5 = .50. Otherwise, students may not order decimals such as .35 and .5 correctly.

Activity

Can You Place the Value?

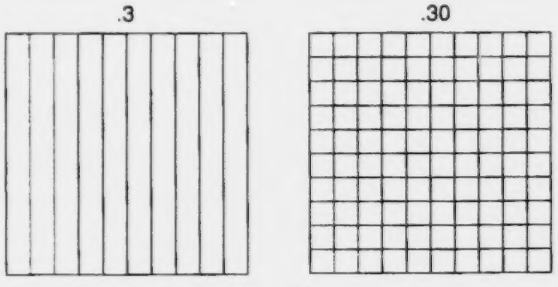
Purpose: introduce the ideas in the lesson

Materials

- PCM 2: Tenths and Hundredths Grids, p. 46

What to Do

Show students tenths and hundredths grids like those on PCM 2. Demonstrate how to shade two grids to show that .3 = .30.



Write the following nine numbers on the board:

.7 (tenths)

.70 (hundredths)

.77 (hundredths)

.07 (hundredths)

.070 (thousandths)

.770 (thousandths)

.707 (thousandths)

.700 (thousandths)

.007 (thousandths)

Distribute a copy of PCM 2 to each student. Ask each student to do the following:

- List all the decimals that are written as tenths and all the decimals that are written as hundredths. Use the grids on PCM 2 to illustrate each decimal in these lists.
- Tell which of the nine decimals are equal to each other. (.7 = .70 = .700; .77 = .770; .07 = .070)
- List the nine decimals under one of these headings:

  equal to seven tenths (.7, .70, .700)

  equal to seven hundredths (.07, .070)

  equal to seventy-seven hundredths (.77, .770)

  not equal to .7, .07, or .77 (.707, .007)
- Ask students to use the < or > symbol and compare each of the nine decimals first to .6, then to .06.

.7 > .6	.7 > .06
.70 > .6	.70 > .06
.77 > .6	.77 > .06
.07 < .6	.07 > .06
.070 < .6	.070 > .06
.770 > .6	.770 > .06
.707 > .6	.707 > .06
.700 > .6	.700 > .06
.007 < .6	.007 < .06

Reading Digital Measurements

Application

SB p. 22

Lesson Objective

- become familiar with common digital measurement tools

Activity

What's Your Number?

Purpose: extend the ideas in the lesson

What to Do

Have students draw four measurement tools, showing a variety of the following and leaving space for the digital numbers. They can use the student book art on pages 22 and 23 as a guide.

odometer

digital thermometer

digital scale

Ask, *"Is it clear on your drawing where the decimal point is, or where the whole number and decimal are separated?"*

Next, have students write numbers on their drawings and exchange their drawings with a partner. Partners should take turns reading each other's decimal numbers aloud, helping each other to write and read digital measurement amounts correctly. Ask, *"Did your partner read the number you intended? If not, what number did you intend?"*

Using Your Calculator

Tools

SB p. 24

Lesson Objective

- add, subtract, multiply, and divide on a calculator

Activity

How to Get Back?

Purpose: extend the ideas in the lesson

Materials

- PCM 3: How to Get Back?, p. 47
- calculators

What to Do

Ask students to list situations in which they use calculators in daily life. Some examples might be grocery shopping, keeping a check register, and on their jobs.

Tell them that in this activity they will use calculators to find secret, or hidden, numbers.

Have students work in pairs or small groups. Distribute a copy of PCM 3 to each group. Go through the first two examples with the class. For example 1, tell them someone entered a hidden number on a calculator, then added 6.5; now the number showing on their calculator is 10.3. To get back to the hidden number they should subtract 6.5 from 10.3. When they do that, they will see that the hidden number was 3.8.

For example 2, students should suggest dividing 7.225 by 1.7 to find the original number, 4.25. Have students make up more problems. One student secretly records a number, then fills in Line B and Box C. Another student fills in Line D and Box E, and checks with the student who recorded the hidden number to see if the answer is correct.

What to Look For

When the operation on Line B is "add," "subtract," "multiply," or "divide," students should fill in Line D with "subtract," "add," "divide," or "multiply," respectively. In later lessons, students will see that they are applying inverse operations.

Writing Expressions

Tools

SB p. 26

Lesson Objectives

- use a variable to represent an unknown number
- write expressions

Common Difficulties

As students start to write expressions, they may not understand that the letters, or variables, represent numbers. In the following activity, students evaluate expressions, replacing each variable with several values, to gain understanding that a variable represents a number.

Activity

Same Expression, Different Values

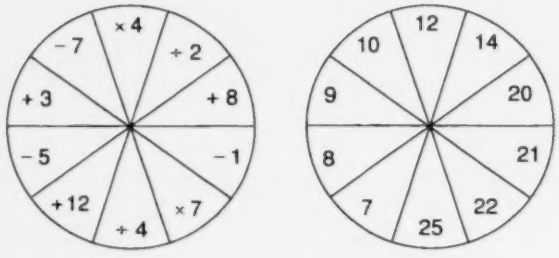
Purpose: extend the ideas in the lesson

Materials

- PCM 1: Spinners, p. 45
- paper clips

What to Do

Have students work in groups of three to six. Distribute paper clips and two copies of PCM 1 to each group. Each group should fill out the two 10-part spinners as follows:



Spinner A Spinner B

One person in the group selects a letter (for example, *s*) and spins the paper clip on spinner A. If that result is "× 4" then everyone in the group writes the expression "$s \times 4$." Each student spins the paper clip on spinner B for her or his own value for *s*, and evaluates "$s \times 4$" using that value. The group can repeat this several times, using different letters.

What to Look For

Students should write three lines for each problem.

$s \times 4$ (spinner A shows "× 4")

10×4 (spinner B shows 10)

$10 \times 4 = 40$

Solving Word Problems

Problem Solver

SB p. 28

Lesson Objectives

- use the five-step problem-solving plan to solve word problems
- use estimation as a problem-solving tool

Activity

"Words for Numbers" Problems

Purpose: reinforce the ideas in the lesson

What to Do

Have students work in pairs or small groups. One student makes up and writes an arithmetic problem, such as:

103	57	251	$\frac{75}{5}$
+ 17	− 40	× 3	
(120)	(17)	(753)	(15)

A second student makes up a "context," such as bus stop, cafeteria, stamp collection, and so on. Then each student in the group writes a word problem to go with the arithmetic problem and the context.

Students should exchange word problems with others in their group and solve the problem they get. Have them discuss how they solved their word problem. Ask, *"Why did everyone in your group have the same answer?"*

Understanding Fractions

SB p. 30

Lesson Objectives

- use a fraction to represent a part of a whole
- understand the relationship between fractions and decimals

Activity

Everyday Fractions

Purpose: introduce the ideas in the lesson

What to Do

Draw this chart on the board:

	Distance	Time	Money
$\frac{1}{10}$			
$\frac{1}{2}$			
$\frac{3}{4}$			

Have students form groups, and let each group choose one of the empty cells in the chart. Each cell has a fraction and a context related to it. Each group should think of a familiar or everyday example of how their fraction is used in their context and explain it to the class. The group that chose $\frac{3}{4}$ and *time* might say that their adult ed class is longer than three-quarters of an hour.

After this discussion, you might ask for some everyday uses of mixed numbers. Examples might be lumber (a two-by-four is actually $1\frac{5}{8}" \times 3\frac{5}{8}"$), hat sizes, shoe sizes, interest rates, and so on.

The Size of Fractions

SB p. 32

Lesson Objectives

- recognize the part of a whole represented by a fraction
- judge whether a fraction is greater than or less than $\frac{1}{2}$

Activity

Come to Order!

Purpose: apply the ideas in the lesson

Materials

- PCM 1: Spinners, p. 45
- PCM 2: Tenths and Hundredths Grids, p. 46
- paper clips

What to Do

Have students work in small groups. Distribute copies of PCM 1 and PCM 2 to each group. Ask students to number the spinners on PCM 1 from 1 to 4, 1 to 6, or 1 to 10, as appropriate. Everyone in the group should select a spinner and spin the paper clip. They should use their result as a numerator and the number of sectors in the spinner as a denominator. A group might generate $\frac{2}{4}$, $\frac{1}{6}$, $\frac{10}{10}$, etc.

Ask the groups to do and discuss the following:

- Use PCM 2 to draw, exactly or approximately, each fraction they generate.
- Compare each of the fractions to $\frac{1}{2}$, using $=$, $<$, and $>$.
- Order the group's fractions from smallest to largest.

Forms of Fractions

SB p. 34

Lesson Objectives

- recognize that a fraction represents division
- change an improper fraction to a mixed number
- change a mixed number to an improper fraction
- express a fraction as a decimal

Common Difficulties

Learners sometimes switch the numerator and denominator of a fraction when they write the fraction as a division problem or find a decimal value for the fraction using a calculator.

Activity

Fractions on a Hundredths Grid

Purpose: apply the ideas in the lesson

Materials

- PCM 2: Tenths and Hundredths Grids, p. 46
- calculators

What to Do

Draw a 10-by-10 grid on the board. Tell students that it represents the number 1. Then write a fraction less than 1, such as $\frac{12}{17}$ and ask the students to come up with a way to approximate $\frac{12}{17}$ on the grid.

If no one suggests using a calculator to approximate the fraction as the decimal .71, bring up that idea. Then shade .71 (71 squares) on the grid.

Distribute a copy of PCM 2 to each student. Students will use only the hundredths grids. Ask a student for any fraction between 0 and 1. Have other students use calculators to convert the fraction to a decimal. Then have them shade in the decimal on the hundredths grid.

Next write these two fractions on the board:

$\frac{10}{21}$ $\frac{12}{23}$

Ask students to convert each fraction to a decimal using a calculator (Answers: .48 and .52) and shade the decimals on a hundredths grid.

Finally, ask, *"Which is larger, ten twenty-firsts or twelve twenty-thirds?"* ($\frac{12}{23}$ is larger.)

What to Look For

Be sure that students use the denominators as the divisors when they convert fractions to decimals.

Equivalent Fractions

SB p. 36

Lesson Objectives

- understand the concept of equivalent fractions
- multiply or divide by a fraction equal to 1 to obtain an equivalent fraction
- put a fraction in lowest terms

Activity

Some Shady Figures

Purpose: apply the ideas in the lesson

Materials

- PCM 4: Fraction Figures, p. 48

What to Do

Write these three groups of fractions on the board:

Group A: $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{8}$

Group B: $\frac{3}{8}$ $\frac{5}{8}$ $\frac{7}{8}$

Group C: $\frac{2}{3}$ $\frac{5}{6}$

Distribute three copies of PCM 4 to each student. Tell each student to select one fraction from each group. Students should use one sheet for each fraction they choose. They should write one fraction in the box at the top of each sheet. Students should select the figures that can represent that fraction. Then they should shade in parts of those figures to represent equivalent fractions. Then they should label each figure with the equivalent fraction that it represents. For example, suppose their fraction is $\frac{2}{3}$. They should select circle B, shade in 2 of the 3 parts, and label it $\frac{2}{3}$. Then they should select circle D, shade in 4 of the 6 parts, and label it $\frac{4}{6}$. In all for the fraction $\frac{2}{3}$, they should select circles B and D, hexagon F, triangles H and I, and square M.

When students complete the activity, you can group together all the sheets for the same fraction and compare them.

Filling in a Grid

Tools

SB p. 38

Lesson Objectives

- fill in fractions and decimals on a five-column grid
- compare fractions and decimals to the value $\frac{1}{2}$

Activity

Greater Than $\frac{1}{2}$

Purpose: reinforce the ideas in the lesson

Materials

- PCM 5: Five-Column Grids, p. 49
- PCM 6: Greater Than $\frac{1}{2}$, p. 50
- Deck of playing cards with face cards removed

What to Do

Have students work in pairs. Distribute copies of PCM 5 and PCM 6 to each student. Each pair of students will need a deck of playing cards. Students may make their own decks by writing the numbers 1–10 four times on index cards.

1. Have students shuffle the cards and deal 18 to each player.
2. Students should write the numbers from their hands in the boxes on PCM 6. The goal is to make as many proper fractions and decimals as possible with a value greater than $\frac{1}{2}$.
3. Once students are satisfied with the arrangement of numbers on their worksheet, they should grid the fractions and decimals on PCM 5.
4. Have students circle the answers that are greater than $\frac{1}{2}$. The student with the most answers greater than $\frac{1}{2}$ wins the game.

What to Look For

As students grid in numbers, check grids for accuracy. Discuss strategies for comparing fractions and decimals to $\frac{1}{2}$.

Reading Fraction Measurements

Application

SB p. 40

Lesson Objectives

- become familiar with common measurement tools that use fractions
- compare fractions using measurement tools

Activity

Mark My Riddle

Purpose: introduce the ideas in the lesson

Materials

- yardsticks

What to Do

Tell students, *"Here is a riddle: How many one-eighth-inch marks are there on a yardstick?"*

Tell students that the riddle has many correct answers, and the most important part of any answer is the explanation. Ask them to think of as many different answers and explanations as they can.

Possible answers include:

288 (There are 8 marks per inch and $8 \times 36 = 288$.)

144 (Only the marks at $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$ and $\frac{7}{8}$ are $\frac{1}{8}$*-inch marks.* The others are marks for quarter, half, and whole inches. So there are 4 marks per inch, and $36 \times 4 = 144$.)

36 (The $\frac{3}{8}$*-inch mark* is not a $\frac{1}{8}$*-inch mark.* So there is one per inch.)

1 (The mark at $1\frac{1}{8}$ inches is a $1\frac{1}{8}$*-inch mark.* So there is only one $\frac{1}{8}$*-inch mark.*)

Have students discuss their answers among themselves and present their answers and explanations to the class.

At the end of the discussion, point out that often it is useful to come up with more than one solution to a problem. Multiple solutions show flexible thinking, and returning to a problem you think you have already solved can give you new insights into it.

Understanding Percent

SB p. 42

Lesson Objectives

- understand that a whole is 100%
- recognize that *percent* refers to the number of parts out of 100
- explore the relationship between percent, decimals, and fractions

Activity

One, Two, Three, War!

Purpose: introduce the ideas in the lesson

Materials

- PCM 7: Card Deck #1, p. 51
- scissors

What to Do

Describe the meaning of *percent* to students, and distribute a copy of PCM 7 to each student. Have each student cut out the 16 cards, shuffle them, and find a partner to play "War." Here are the rules:

1. Each player turns over the top card of his or her deck. The players compare these values, and the higher value wins the two cards. If the values are equal (for example, 25% and $\frac{1}{4}$, 25% and $\frac{25}{100}$, 25% and .25), the two players say, "War!"
2. For "War" each player counts out three cards, facedown, then turns over a fourth card and compares values. If one value is higher, that player wins all the cards. If the values match, it is "War" again.
3. The game ends when one player has no more cards, or when a player runs out of cards during a "War."

Variation: For variety, change the rules in one of the following ways:

A. In each comparison of cards, the lower value wins the cards.

B. If the games end too quickly, students can put down only two cards for a "War."

C. Three or more players can compete together; only those with winning, matching values take part in a "War."

Solving Multistep Problems

Problem Solver

SB p. 44

Lesson Objective

- use the five-step problem-solving plan to solve multistep problems

Activity

We're in Charge

Purpose: introduce the ideas in the lesson

What to Do

Discuss this scenario with the class:

Suppose Tina's school had the highest success rate on the GED tests last year, and as a result all the adult ed students and their teachers have been invited to the State Education Building for a celebration. Tina's class is in charge of transportation. How can they get everyone there?

Lead a discussion, bringing out these initial stages of problem solving:

1. Understand the question.
2. Decide what information is needed to solve the problem.
3. Describe how you might solve the problem.

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Decimals

Unit Overview

This unit explores operations with decimals: addition, subtraction, multiplication, and division; introduces writing and solving one-step equations; and works with decimals using estimating and rounding. This unit also introduces metric measurement.

When Do I Use Decimals? page 49

Have students complete the checklist and answer the questions individually. Start a discussion about these and other real-life situations and equipment that involve decimals, such as cash registers, dials and gauges on machinery, and digital thermometers and weight scales. Ask, *"Did you learn how to use decimals in school, on the job, at home, or from friends?"* Have students look over the table of contents for unit 2 and discuss how many of the lessons reflect their everyday uses of decimals.

Talk About It page 49

Have students describe how workers who make change give their customers a chance to count the change. For example, bank tellers and most cashiers count out the bills and change so the customer can check the amount, while a subway booth worker often spreads out the change before pushing it through the small window so the customer can see it. Ask, *"Why is it important to cashiers that customers count their change before leaving the cashier's window?"*

Working Together page 85

Have students discuss whether they prefer to stock up on nonperishable items or buy just what they need for the coming days. As part of that discussion, ask students how they use unit-pricing information to help decide whether larger sizes of items are better bargains than smaller sizes.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
Rounding and Estimating Decimals	50	13	Reasoning	1
Understanding the Question	52	13	Communication	
Adding Decimals	54	14	Hands-On	8
Subtracting Decimals	56	14	Hands-On	8
Addition and Subtraction Equations	58	14	Reasoning	9
Solving Addition and Subtraction Equations	60	15	Cooperative Learning	
Balancing a Checkbook	62	16	Hands-On	8, 10
Multiplying Decimals	64	16	Cooperative Learning	
Gridding in Decimal Answers	66	16	Grid Activity	5, 11
Dividing a Decimal by a Whole Number	70	17	Communication	
Dividing by a Decimal	72	17	Reasoning	12
Metric Measurement	74	18	Hands-On	13
Estimating with Friendly Numbers	76	18	Cooperative Learning	
Order of Operations	78	18	Problem Solving	14
Calculators and Decimal Answers	80	19	Hands-On	15
Mileage and Miles per Gallon	82	19	Hands-On	16

Rounding and Estimating Decimals

Tools

SB p. 50

Lesson Objectives

- round decimals to whole numbers, tenths, and hundredths
- use the symbol ≈ when rounding numbers

Activity

The Round Up

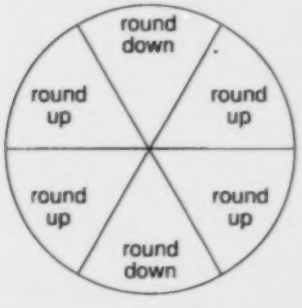
Purpose: extend the ideas in the lesson

Materials

- PCM 1: Spinners, p. 45
- paper clips

What to Do

Let students work in groups. Distribute a copy of PCM 1 to each group. Students should use the six-part spinner, labeling two sectors "round down" and labeling the other four sectors "round up."



In each group, one student should write a decimal number that contains hundredths, such as 12.57, and spin the paper clip.

- If the clip points to "round up," the other students in the group write three decimal numbers that round up to 12.57 (examples are 12.568, 12.569, and 12.565).
- If the clip points to "round down," the other students write three decimal numbers that round down to 12.57 (examples are 12.574, 12.571, and 12.573).

Each student in the group should have a turn picking a number and spinning.

Understanding the Question

Problem Solver

SB p. 52

Lesson Objectives

- identify the question being asked in a word problem
- evaluate the information provided in a word problem

Common Difficulties

Some learners jump right into a problem and assume they know what the question is. By making up more than one question for a problem, they may start to realize that a clear understanding of the question is vital for problem solving.

Activity

That's Another Question

Purpose: introduce the ideas in the lesson

What to Do

Ask a student to tell the class some numerical facts about a subject such as getting to class or taking a family outing. Write the facts on the board. An example could be, *"I took my three children to the zoo. We left at eleven A.M. The bus trip took fifteen minutes and cost four dollars and fifty cents. I spent twenty-two dollars and fifty cents on admission and food. We got home at four P.M."*

Ask the class to come up with as many different questions as they can using some or all of the information. For each question, ask whether the question can be answered based on the available facts. Possible questions include *"How long were they gone?"* (can be answered) and *"How much was spent on food alone?"* (cannot be answered).

Ask, *"For any written problem or set of facts, can you always make up more than one question?"* Students should see that many questions are always possible.

Expansion/Reinforcement: When students are working on the student book lesson, ask them to come up with two or three "alternative questions" for each problem. This can help them focus on what is, and what is not, the question in each problem.

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Adding Decimals

SB p. 54

Lesson Objectives

- line up decimal points and write placeholder zeros in "empty" decimal places
- add a decimal and a whole number
- add a decimal and a decimal
- use grouping strategies

Activity

Reimbursing a Property Manager

Purpose: apply the ideas in the lesson

Materials

- PCM 8: Reimbursing a Property Manager, p. 52

Note: Calculators should *not* be used for this activity so students get practice in writing numbers with the decimal points aligned.

What to Do

Discuss the tasks involved in maintaining an apartment building. Tasks could include cleaning hallways and laundry rooms, buying supplies, running advertisements for empty apartments, paying monthly operating bills, and so on.

Tell students to suppose that a property manager oversees three buildings, and she charges small expenses for the buildings on a credit card. When the bill comes, she labels each expense with the property it belongs to, so each property owner can reimburse her the correct amount.

Distribute copies of PCM 8 to all students. Point out that the X's indicate which property each expense belongs to. Tell students to copy the amounts into the appropriate boxes. Then ask students to find the amount the manager should be reimbursed by each of the three property owners and the total amount due.

Note: Students should save their work from this activity. It is referred to in the next lesson.

Subtracting Decimals

SB p. 56

Lesson Objectives

- subtract a decimal from a whole number
- subtract a decimal from a decimal
- change a fraction to a decimal

Activity

How Close to Last Month?

Purpose: apply the ideas in the lesson

Materials

- PCM 8: Reimbursing a Property Manager (Students should have their filled-in copies.)

Note: Calculators should *not* be used for this activity so students get practice in writing numbers with the decimal points aligned.

What to Do

Tell students that this is a continuation of the activity from the previous lesson. Have them refer to their completed work on PCM 8. Tell them that *last month's* expenses were as follows:

Property 1	$82.55
Property 2	$174.03
Property 3	$50.90

Ask students to determine whether the expenses on PCM 8 for each property are *more than* or *less than* last month's expenses, and by how much.

Note: Have students save their work from this activity. It is referred to in "Balancing a Checkbook" (page 16).

Addition and Subtraction Equations

Tools

SB p. 58

Lesson Objectives

- understand and write math equations
- use a variable to represent an unknown number

Common Difficulties

The skill of representing a picture or diagram with an equation is new and may be difficult for some students. This activity focuses on that skill.

Activity

Picturing Equations

Purpose: introduce the ideas in the lesson

Materials

- PCM 9: Picturing Equations #1, p. 53

What to Do

Distribute a copy of PCM 9 to each student. Discuss problems 1 and 2, which are done as examples. Each problem has a diagram that illustrates the information in the problem. Each diagram is represented with two addition equations and two subtraction equations. Ask students what an equation with a "+" sign can represent. Make sure they understand it can represent joining two objects to form a larger one. Also, ask students what an equation with a "–" sign can represent. They should say it can represent taking an object away from a larger object.

Ask students to read the directions for problems 3–6. For each illustration they should write four equations.

Variation: Ask students to write a word problem to go with each illustration.

What to Look For

Students should be able to use descriptive language like *put together* and *take away* to describe equations involving addition or subtraction. Also, they should recognize that the "extra" information in problems 5 and 6 does not affect the equations they write for the illustration.

Solving Addition and Subtraction Equations

SB p. 60

Lesson Objectives

- solve one-step addition and subtraction equations that contain variables
- understand that addition and subtraction are inverse operations

Common Difficulties

Some learners do not interpret $x + 15$ as "15 added to x," and may not understand why they should use an inverse operation ("subtract 15") to solve for x. To help students focus on inverse operations, you can ask, *"What was done to x to get $x + 15$?"* Then point out that by subtracting 15, they can return to x.

Activity

Do and Undo

Purpose: introduce the ideas in the lesson

What to Do

Ask students to write a math expression for the phrase "twenty-two less than an unknown number." Discuss what is the same and what is different for all their written expressions. (Students probably used different variables, but all should be in the form $y - 22$.)

Ask students to describe what was done to their unknown number (22 was subtracted). Then ask students to explain what they get if they add 22 to the expression $y - 22$. You can use specific values for the unknown number to explain that $y - 22 + 22$ results in the original value of the unknown number.

Have students work in groups. Give each group two simple addition expressions and two simple subtraction expressions, such as $p + 18$, $r - 5$, $s + 30$, and $q - 150$. Have students answer and discuss three questions for each expression:

1. *"What was done to the unknown number?"* (18 was added to p.)
2. *"How can you get back to the unknown number?"* (Subtract 18.)
3. *"What seems to be the relationship between addition and subtraction for these examples?"* (They are opposites; each one undoes what the other does; + 18 and – 18 combine to equal zero.)

Balancing a Checkbook
Application

SB p. 62

Lesson Objective

- add and subtract a series of decimals in a real-life situation

Activity

Finding the Balance

Purpose: apply the ideas in the lesson

Materials

- PCM 10: Finding the Balance, p. 54

What to Do

Remind students of the property manager who uses a credit card to charge small expenses for the maintenance of three properties (*TRG* page 14 and PCM 8).

Distribute copies of PCM 10. Explain that the property manager has a budget of $1,000 per year for the small expenses of each property. She uses a register to keep track of the amount she has spent on each of the three buildings. The property manager needs to figure the balance for each of the three properties. Ask students to find the final balance for each building.

Multiplying Decimals

SB p. 64

Lesson Objectives

- place a decimal point in a product
- multiply a decimal by a whole number
- multiply a decimal by a decimal
- add placeholder zero(s) to a product to keep the correct number of decimal places
- use shortcuts to multiply a decimal by 10, 100, or 1,000

Activity

The Cashier's Nightmare

Purpose: apply the ideas in the lesson

Materials

- calculators

What to Do

Write this sales tax information on the board:

medication: $\frac{1}{2}\%$ or 0.005

food, drink, cosmetics: $5\frac{3}{4}\%$ or 0.0575

general merchandise: $8\frac{1}{4}\%$ or 0.0825

Tell the class to suppose that their county has imposed a three-level sales tax rate, so stores have to charge sales tax at a different rate for different kinds of items. Then the nightmare happened: the cash register broke, and the cashiers had to use a calculator to find the tax and total cost for each item.

With the help of the class, make up a shopping list with items and prices. The final list should have two to four items from each of the three sales tax categories. Some examples might be:

10 lb. of oranges at $.69 per lb. ($7.30)

12 bottles of aspirin at $5.43 per bottle ($65.49)

8 packages of paper plates at $2.35 per package ($20.35)

Form groups of three to five students and declare a contest: *"Which group can be the first to find the total cost of the shopping list?"* (Total for above list is $93.14.) Each group should decide which tax category is appropriate for an item, and then calculate the cost, the tax, and the total cost for that item. Finally, they should find the total for all of the items.

Gridding in Decimal Answers
Tools

SB p. 66

Lesson Objectives

- fill in decimal numbers on a five-column grid
- create decimal word problems

Activity

Decimal Weights

Purpose: reinforce the ideas in the lesson

Materials

- PCM 5: Five-Column Grids, p. 49
- PCM 11: Decimal Weights, p. 55

What to Do

In this activity, students will work in pairs to write and solve nine decimal word problems involving weights. The answers to the problems must contain no more than four digits and a decimal point.

Give each student a copy of PCM 5 and each pair of students a copy of PCM 11. Have students take turns selecting weights or numbers from PCM 11 to write a problem. Each number or weight can be used only once. Each pair of students should write three problems requiring addition, three requiring subtraction, and three requiring multiplication.

For example, if a student selects 1.9 kg, the number 4, and the operation multiplication, the problem might read: *"A book weighs 1.9 kilograms. What is the weight of 4 of the books?"* Answer: 7.6 kg

Students should create an answer key for their problems by filling in the grids on PCM 5.

What to Look For

Check grids for accuracy. If students have trouble creating situations for a particular operation, they may use the problems in the student book on pages 53, 55, and 63 as models.

Dividing a Decimal by a Whole Number

SB p. 70

Lesson Objectives

- divide a decimal by a whole number
- add zeros when needed in a division problem

Activity

Check, Please!

Purpose: introduce the ideas in the lesson

What to Do

Discuss this situation with the class:

Your adult ed class of 19 people has gone to a restaurant. Ask, *"What did you eat? What did you drink? Was the service good? Most important, what did you have for dessert?"* Tell students that the bill for food and drink came to $223.37, and because of the size of the group the restaurant automatically added a tip of 15%. Ask, *"How much was the total bill, including the tip?"*
($223.37 + $33.51 = $256.88)

Discuss how to calculate what each person owes. (Divide the total cost of $256.88 by 19; $256.88 ÷ 19 = $13.52.)

Expansion/Reinforcement: Ask students if the amount of the tip is correct ($223.37 × .15 = $33.5055; the restaurant rounded it to $33.51).

For a lively discussion, ask how the check should be divided if some people did not order drinks, or some had no dessert, or some wanted to reward the service with more than a 15% tip.

Dividing by a Decimal

SB p. 72

Lesson Objectives

- divide by a decimal
- use zeros and move the decimal point when dividing by a decimal

Activity

Writing Division Problems

Purpose: apply the ideas in the lesson

Materials

- PCM 12: Writing Division Problems, p. 56

Note: Calculators should *not* be used for this activity so students get practice moving and placing decimal points.

What to Do

Distribute copies of PCM 12. Have students work in pairs and write out answers to problems 1–4. After students have had time to work on the eight division problems, discuss some of the patterns they see in problems 1 and 2, and in problems 3 and 4.

Metric Measurement

Application

SB p. 74

Lesson Objectives

- become familiar with the metric system
- learn the words *meter, gram,* and *liter,* and the prefixes *centi-, milli-, kilo-, hecto-, deko-,* and *deci-*
- convert decimal units

Activity

Measuring Practice

Purpose: apply the ideas in the lesson

Materials

- PCM 13: Measuring Practice, p. 57
- metric rulers

What to Do

Distribute a copy of PCM 13 and a metric ruler to each student. For question 1, ask, *"To the nearest centimeter, what are the length and width of the large rectangle?"* (21 cm by 16 cm). Then discuss how to calculate the area of a rectangle (multiply the length by the width). Use the formula $A = l \times w$ to find the area of the rectangle (336 square centimeters).

Ask students to find the rest of the measurements and perform the calculations called for on the PCM.

Estimating with Friendly Numbers

Tools

SB p. 76

Lesson Objectives

- understand the concept of "friendly numbers"
- estimate using rounding and "friendly numbers"
- estimate using "easy 10s"

Activity

Estimate the Price

Purpose: extend the ideas in the lesson

Materials

- newspaper advertisements

What to Do

Bring, or ask students to bring, newspaper advertisement sections to class. Look for advertisements from grocery stores, convenience stores, or drugstores. Choose one ad and demonstrate how to estimate using friendly numbers. Here are two examples:

- *"This store is advertising six kiwis for one dollar. Estimate—about how much is each kiwi?"* (Look for friendly numbers. Show that 6 is close to 5, which is compatible with $1.00. Divide $1.00 by 5. Each kiwi is a little less than $.20.)
- *"This meat is on sale for one dollar and ninety-eight cents a pound. About how much would six pounds cost?"* ($1.98 is about $2.00. 6 pounds × $2.00 = $12.00. The meat would cost a little less than $12.00.)

Divide the class into groups. Give each group ads for a variety of different products. Ask groups to choose quantities for several of the products and then estimate their pretax prices. Encourage groups to use friendly numbers and to estimate with 10s whenever possible.

Order of Operations

Problem Solver

SB p. 78

Lesson Objectives

- use the order of operations to solve an equation with more than one operation
- write expressions with two or more arithmetic operations

Activity

Golden Anniversary

Purpose: apply the ideas in the lesson

Materials

- PCM 14: Golden Anniversary, p. 58

What to Do

Distribute copies of PCM 14 to all students and have the class read and discuss it. Ask, *"Is any scenario more realistic than any other? Why?"*

Have the students write arithmetic expressions and explain their answers for the three scenarios.

Calculators and Decimal Answers

Tools

SB p. 80

Lesson Objectives

- work with decimal numbers on a calculator
- practice rounding repeating decimals and number series

Common Difficulties

In division problems, students sometimes switch the numbers before and after the ÷ key. Similarly, they sometimes switch the numerator and denominator when they divide fractions. This activity focuses on which numbers go before and after the ÷ key.

Activity

War with Sixths and Sevenths

Purpose: apply the ideas in the lesson

Materials

- PCM 15: Card Deck #2, p. 59
- scissors
- calculators

What to Do

Distribute a copy of PCM 15 to each student. Have each student cut out the 15 cards, shuffle them, and find a partner to play "War." Here are the rules for this version of the game:

1. Each player turns over the top card of his or her deck. The players then use calculators to change the fractions on the cards to decimals.
2. Players compare decimal values for the two cards. The higher value wins the two cards.
3. Two cards match in value if, when rounded *to the nearest tenth,* the decimal values are the same. (For this rule, cards that match are the fractions $\frac{0}{6}$ and $\frac{0}{7}$, the fractions $\frac{2}{6}$ and $\frac{2}{7}$, the fractions $\frac{4}{6}$ and $\frac{5}{7}$, and the fractions $\frac{6}{6}$ and $\frac{7}{7}$.)

   If the decimal values are equal, the two players say, "War." They each put down three cards, then turn over a fourth card, divide, and compare values. If one value is higher, that player wins all the cards. If the values match, it is "War" all over again.
4. The game ends when one player has no more cards or runs out of cards during a "War."

Mileage and Miles per Gallon

Application

SB p. 82

Lesson Objectives

- calculate miles traveled
- calculate miles per gallon

Activity

On the Road Again

Purpose: apply the ideas in the lesson

Materials

- PCM 16: Mileage and Miles per Gallon, p. 60
- scissors
- calculators

What to Do

Distribute a copy of PCM 16 to each student. Students should follow the instructions on the PCM and cut off the strip of numbers from the right side, cut out the window, and cut the two horizontal slots in the paper (as marked). Then they should insert

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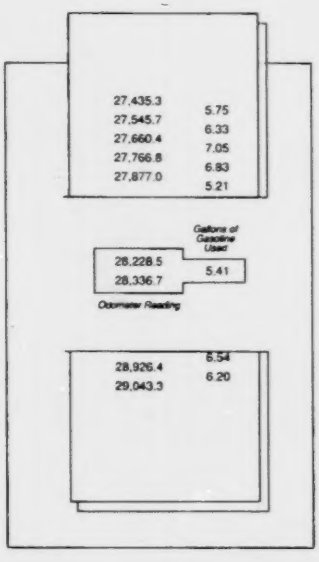
the strip so three numbers show in the window, as shown here.



Tell students to write two headings on a sheet of paper, "Length of Trip" and "Miles per Gallon." Then they can use the PCM as follows:

1. Move the strip until two odometer readings (left column) and one gas reading (right column) show in the window.
2. Use the two odometer readings to calculate the total distance of the trip, and record it on the sheet of paper under "Length of Trip."
3. Divide the distance by the number of gallons to calculate the miles per gallon for the trip, and record it on the sheet of paper under "Miles per Gallon." Students should round their answers to the nearest tenth.

Expansion/Reinforcement: Students can add numbers to the odometer readings and gallons, and calculate miles per gallon for their new data.

Unit 3

Fractions

Unit Overview

The purpose of this unit is to explore operations with fractions and mixed numbers. This unit also develops number sense for fractions, explores problems involving fractions, and introduces writing and solving one-step multiplication and division equations.

When Do I Use Fractions? page 87

Have students complete the checklist and answer the questions individually. As a class, discuss these and other real-life fraction applications. Ask where students learned to work with fractions.

Talk About It page 87

After the list is made, discuss the denominators for each item on the list (fractions of inches use denominators 2, 4, 8, and 16; mileage amounts on a car's odometer use the denominator 10). Discuss why the metric system is so widely used around the world (the denominators are always multiples of 10).

Working Together page 133

Have students discuss strategies for identifying the largest and smallest sum or difference for the fraction cards. Have another set of fraction cards ready to test and investigate the conjectures of the class.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
Estimating the Size of Fractions	88	22	Reasoning	
Adding and Subtracting Like Fractions	90	22	Hands-On	17
Choosing Necessary Information	92	23	Cooperative Learning	18
Writing Equivalent Fractions	94	23	Reasoning	
Adding Unlike Fractions	96	23	Hands-On	17
Subtracting Unlike Fractions	98	24	Reasoning	
Adding Mixed Numbers	100	24	Cooperative Learning	19
Subtracting Mixed Numbers	102	24	Reasoning	
Working with Distances	104	25	Hands-On	20
Multiplying Whole Numbers and Fractions	108	25	Communication	
Multiplying Fractions	110	26	Hands-On	21
Multiplying Whole and Mixed Numbers	112	26	Communication	
Drawing a Picture	114	27	Hands-On	22
Dividing Fractions	116	27	Hands-On	
Dividing with Mixed Numbers	118	28	Reasoning	
Multiply or Divide?	120	28	Reasoning	
Multiplication and Division Equations	122	29	Reasoning	23
Solving Multiplication and Division Equations	124	29	Cooperative Learning	
Fractions and Your Calculator	126	30	Hands-On	
Fractions and Money	128	30	Hands-On	24
Gridding in Fraction Answers	130	30	Grid Activity	5

Estimating the Size of Fractions

SB p. 88

Lesson Objectives

- recognize fractions close to 1 and to $\frac{1}{2}$
- understand the relationship between the numerator and denominator of fractions that are close to 1 and to $\frac{1}{2}$

Activity

How Close Can You Get?

Purpose: apply the ideas in the lesson

What to Do

Write $\frac{?}{25}$ on the board. Ask students to write five fractions with denominator 25. Give them the following guidelines for the fractions:

1. close to, but greater than 0 (example: $\frac{1}{25}$)
2. close to, but less than $\frac{1}{2}$ (example: $\frac{11}{25}$)
3. close to, but greater than $\frac{1}{2}$ (example: $\frac{13}{25}$)
4. close to, but less than 1 (example: $\frac{24}{25}$)
5. close to, but greater than 1 (example: $\frac{26}{25}$)

Ask volunteers to write their fractions on the board. As a class, choose the fraction closest to 0, to $\frac{1}{2}$ and to 1. Repeat this process, using $\frac{?}{99}$.

Next, ask the class for fractions with denominators 25 and 99 that are *equal* to 0 or to 1 ($\frac{0}{25}$, $\frac{0}{99}$, $\frac{25}{25}$, $\frac{99}{99}$). Ask if they can write fractions with denominators 25 and 99 that are *equal* to $\frac{1}{2}$. (Yes, if you allow fractions like $\frac{12.5}{25}$ or $\frac{12\frac{1}{2}}{25}$; otherwise, no.)

Adding and Subtracting Like Fractions

SB p. 90

Lesson Objectives

- add and subtract like fractions
- change an improper fraction to a mixed number
- simplify a fraction to lowest terms

Activity

A Fraction of the Time

Purpose: introduce the ideas in the lesson

Materials

- PCM 17: Clocks, p. 61

What to Do

Draw a clock face on the board. Ask, *"How many minutes are in one hour?"* (60) Explain why a fraction of an hour will have a denominator of 60. For example, 15 minutes = $\frac{15}{60}$. Shade the clock face, as shown here, to represent 15 minutes.

15 minutes

Ask, *"What fraction do we get when we add another fifteen minutes to the clock?"* ($\frac{30}{60}$) Shade the same clock face to represent an additional 15 minutes, and write on the board: $\frac{15}{60} + \frac{15}{60} = \frac{30}{60}$.

Ask, *"What's another way to refer to thirty-sixtieths?"* ($\frac{1}{2}$ hour) Show that $\frac{30}{60}$ is simplified to $\frac{1}{2}$. Write on the board: $\frac{30}{60} \div \frac{30}{30} = \frac{1}{2}$.

Distribute copies of PCM 17. Have students work in pairs to do these problems:

1. *Shade thirty minutes, then fifteen minutes. Add the two fractions. Simplify the answer to lowest terms.* ($\frac{45}{60} = \frac{3}{4}$ hour)
2. *Shade fifteen minutes, then five. Add. Simplify.* ($\frac{20}{60} = \frac{1}{3}$ hour)
3. *Shade ten minutes, then thirty. Add. Simplify.* ($\frac{40}{60} = \frac{2}{3}$ hour)
4. *Shade forty minutes lightly. Erase ten minutes. Subtract the fractions. Simplify.* ($\frac{30}{60} = \frac{1}{2}$ hour)
5. *Shade fifty minutes lightly. Erase five minutes. Subtract. Simplify.* ($\frac{45}{60} = \frac{3}{4}$ hour)

Choosing Necessary Information

SB p. 92

Lesson Objectives

- identify necessary and extra information in word problems
- solve problems that have extra information

Activity

Extra! Extra!

Purpose: introduce the ideas in the lesson

Materials

- PCM 18: Extra! Extra!, p. 62

What to Do

Write these headings on the board:

Question
Necessary Information
Extra Information

Distribute a copy of PCM 18 to each student. Read situation A. Explain that the example is just one of many questions that can be written about situation A. Discuss the necessary and extra information given for the example. (total cost for example = $208.50)

Have students work in groups and write at least two questions for A, B, and C. Next, have groups develop two questions into word problems with both necessary and extra information. Then have groups exchange and solve each other's word problems.

Writing Equivalent Fractions

SB p. 94

Lesson Objectives

- write equivalent fractions
- find a common denominator for two fractions

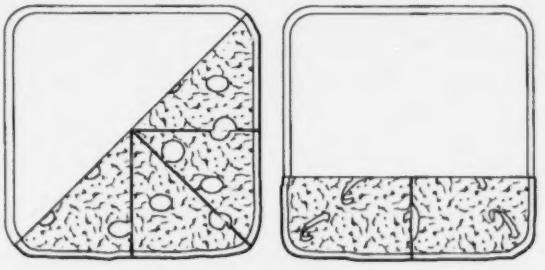
Activity

Sharing Slices

Purpose: introduce the ideas in the lesson

What to Do

Draw two squares as shown:



Tell the class to suppose that yesterday they ordered two square pizzas from Square Deal Pizza. Today, $\frac{1}{2}$ of the pepperoni pizza remains and $\frac{1}{3}$ of the green pepper pizza remains.

Four people want to share the leftover pepperoni pizza, and two people want to share the green pepper pizza. Ask, *"If each of the six people receives one slice, which slices will be larger, the pepperoni or the green pepper?"* (The green pepper slices will be larger.)

Explanation: Each pepperoni slice is $\frac{1}{8}$ of the original pie. Each green pepper slice is $\frac{1}{6}$ of the original pie. $\frac{1}{8} = \frac{3}{24}$; $\frac{1}{6} = \frac{4}{24}$; so $\frac{4}{24}$ is the larger amount.

Expansion/Reinforcement: During the discussion, ask, *"When does each person get a larger piece: when eight people share or when six people share?"* Use their answers to discuss the fact that, for fractions with numerator 1 such as $\frac{1}{6}$ and $\frac{1}{8}$, the fraction gets smaller as the denominator gets larger.

Adding Unlike Fractions

SB p. 96

Lesson Objectives

- add unlike fractions
- explain how to solve word problems

Activity

Adding Time

Purpose: introduce the ideas in the lesson

Materials

- PCM 17: Clocks, p. 61

What to Do

Draw a clock face on the board. Ask, *"How can you represent one-half hour?"* ($\frac{1}{2} = \frac{30}{60}$) *"One-third hour?"* ($\frac{1}{3} = \frac{20}{60}$) *"One-quarter hour?"* ($\frac{1}{4} = \frac{15}{60}$). If students did not use PCM 17 in "Adding and Subtracting Like Fractions," you may want to review that activity.

Distribute a copy of PCM 17 to each student, and have students work in small groups. Ask each group to solve the following two problems by shading in the clock faces:

1. *Is one-half plus one-third plus one-fourth less than, equal to, or greater than one?* ($\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{30}{60} + \frac{20}{60} + \frac{15}{60} = \frac{65}{60}$, which is greater than 1.)

2. *Is one-half plus one-third plus one-fourth plus one-fifth plus one-sixth less than, equal to, or greater than one and a half?* ($\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} = \frac{30}{60} + \frac{20}{60} + \frac{15}{60} + \frac{12}{60} + \frac{10}{60} = \frac{87}{60}$, which is less than $1\frac{1}{2}$.)

Ask groups to explain their solutions to the class.

Subtracting Unlike Fractions

SB p. 98

Lesson Objectives

- subtract unlike fractions
- estimate with fractions

Activity

Flour Power

Purpose: introduce the ideas in the lesson

What to Do

Tell the class, *"You are making muffins using a recipe that calls for three-fourths cup of flour. But when you open the flour canister, you find you have only one-third cup of flour. How can you calculate how much more flour you need to finish the recipe?"* ($\frac{3}{4} - \frac{1}{3} = \frac{9}{12} - \frac{4}{12} = \frac{5}{12}$, or a little less than $\frac{1}{2}$ cup) Ask volunteers to think of other situations where they would need to subtract unlike fractions.

Adding Mixed Numbers

SB p. 100

Lesson Objectives

- write equivalent fractions
- add mixed numbers, regrouping when necessary
- write and solve mixed-number word problems

Activity

Step by Step

Purpose: apply the ideas in the lesson

Materials

- PCM 19: Adding Mixed Numbers, p. 63

What to Do

Distribute a copy of PCM 19 to each student. Work through the questions for the first problem with the class. Discuss the steps taken to find the sum.

Have students work in pairs or small groups. Each group should answer the questions for Examples 2 and 3. Encourage groups to continue working, making up their own mixed-number addition problems.

Subtracting Mixed Numbers

SB p. 102

Lesson Objectives

- subtract mixed numbers, regrouping when necessary
- estimate with mixed numbers

Activity

Draw the Problem

Purpose: extend the ideas in the lesson

What to Do

Write this problem on the board:

$4 - 2\frac{3}{4}$

Ask, *"How could you represent this subtraction problem in a drawing?"* Demonstrate the answer by

drawing 4 shaded circles as shown. Then erase the shading in $2\frac{3}{4}$ circles.

Step 1

"This is four wholes."

Step 2

"Now we have taken two and three-fourths away from four wholes."

The answer is shown by the *shaded* portion of the original four circles ($1\frac{1}{4}$). Write these subtraction problems on the board without giving the answers:

$2 - 1\frac{5}{8} = (\frac{3}{8})$

$8 - 7\frac{9}{10} = (\frac{1}{10})$

$5 - 2\frac{2}{3} = (2\frac{1}{3})$

$5\frac{1}{2} - 1\frac{3}{4} = (3\frac{3}{4})$

Ask students to work alone and to draw each problem to find the answer. If you would like, write additional problems for students to draw—just be sure that the larger number is either a whole number or a mixed number that contains a "friendly" fraction such as $\frac{1}{2}$.

Working with Distances

Application

SB p. 104

Lesson Objectives

- add and subtract distances using mixed numbers
- write and solve mixed number problems involving distances

Activity

How Close? How Far?

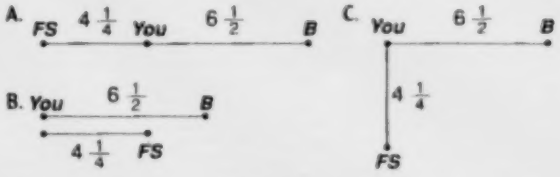
Purpose: extend the ideas in the lesson

Materials

- PCM 20: How Close? How Far?, p. 64
- calculators

What to Do

Tell the class: *"You are visiting relatives in an unfamiliar neighborhood. You are told that there is a bakery six and a half blocks away and a fruit store four and a quarter blocks away. How can you tell the* maximum *and the* minimum *travel distance between the two stores?"* Draw these diagrams on the board:



Discuss how Figures A and C show the maximum travel distance between the two stores and figure B shows the minimum distance.

Figure A: $6\frac{1}{2} + 4\frac{1}{4} = 10\frac{3}{4}$ blocks

Figure B: $6\frac{1}{2} - 4\frac{1}{4} = 2\frac{1}{4}$ blocks

Figure C: $6\frac{1}{2} + 4\frac{1}{4} = 10\frac{3}{4}$ blocks

Have students work individually or in small groups. Distribute a copy of PCM 20 to each student. Ask students to label their diagrams with the correct measurements and find the maximum and minimum distances. Encourage students to make up and solve their own problems.

Multiplying Whole Numbers and Fractions

SB p. 108

Lesson Objectives

- understand the relationship between multiplying by the fraction $\frac{1}{n}$ and dividing by the whole number n
- understand that a fraction like $\frac{5}{8}$ is 5 times the fraction $\frac{1}{8}$
- find a fraction of a whole number

Activity

Cooking for a Crowd

Purpose: introduce the ideas in the lesson

Materials

- flip chart

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What to Do

Before class begins, write this recipe on a flip chart. (*Note:* Save the recipe for use in the activity in "Multiplying Whole and Mixed Numbers.")

Chili Con Carne

2 onions (chopped)
1 clove garlic (chopped)
5 pounds ground beef
4 cups canned tomatoes
10 cups canned kidney beans
3 green peppers (chopped)
2 teaspoons salt
3 teaspoons sugar
4 tablespoons chili powder

Serves 24

Tell the class that they are cooking this recipe for a group, but they don't know whether 6 or 12 people are coming. Help them figure out that $\frac{6}{24} = \frac{1}{4}$ and $\frac{12}{24} = \frac{1}{2}$. Then, as a class, calculate what $\frac{1}{4}$ and $\frac{1}{2}$ of each ingredient would be.

$\frac{1}{4}$ the amount

$\frac{1}{2}$ onion (chopped)
$\frac{1}{4}$ clove garlic (chopped)
$1\frac{1}{4}$ pounds ground beef
1 cup canned tomatoes
$2\frac{1}{2}$ cups canned kidney beans
$\frac{3}{4}$ green pepper (chopped)
$\frac{1}{2}$ teaspoon salt
$\frac{3}{4}$ teaspoon sugar
1 tablespoon chili powder

$\frac{1}{2}$ the amount

1 onion (chopped)
$\frac{1}{2}$ clove garlic (chopped)
$2\frac{1}{2}$ pounds ground beef
2 cups canned tomatoes
5 cups canned kidney beans
$1\frac{1}{2}$ green peppers (chopped)
1 teaspoon salt
$1\frac{1}{2}$ teaspoons sugar
2 tablespoons chili powder

What to Look For

Students should see that to multiply by $\frac{1}{4}$ they can divide by 4, and that to multiply by $\frac{1}{2}$ they can divide by 2.

Multiplying Fractions

SB p. 110

Lesson Objectives

- multiply fractions
- cancel to simplify fractions when multiplying

Activity

Fractions in the Shade

Purpose: introduce the ideas in the lesson

Materials

- PCM 21: Multiplying Fractions, p. 65

What to Do

Have students form small groups. Distribute a copy of PCM 21 to each student. Discuss the steps and the art shown on the PCM.

Have students follow the steps to illustrate the two multiplication problems at the bottom of the PCM.

Multiplying Whole and Mixed Numbers

SB p. 112

Lesson Objectives

- multiply a whole number by a fraction
- change a mixed number to an improper fraction
- multiply a whole number by a mixed number
- multiply a fraction by a mixed number

Activity

Cooking for a Bigger Crowd

Purpose: introduce the ideas in the lesson

Materials

- flip chart with recipe for chili con carne (page 26)

What to Do

Display the chili con carne recipe and say, *"Suppose you need to make this recipe for sixty people. By what number should each ingredient be multiplied?"*

If students do not come up with the exact answer of $2\frac{1}{2}$ ($\frac{60}{24} = \frac{48}{24} + \frac{12}{24} = 2\frac{1}{2}$), lead them to it with these number-sense questions:

1. *"What is the largest number that divides into both twenty-four and sixty?"* (It is 12.)
2. *"What fraction of a recipe do we need for twelve people?"* ($\frac{12}{24} = \frac{1}{2}$)
3. *"How many groups of twelve people are in the whole group?"* (5 groups, because $5 \times 12 = 60$)
4. *"How many half recipes are needed?"* ($\frac{1}{2}$ recipe for each group of 12, or $5 \times \frac{1}{2}$ recipe. That is $\frac{5}{2}$ or $2\frac{1}{2}$ times the recipe.)

Then, as a class, multiply $\frac{5}{2}$ by each amount in the recipe to get the amount needed to serve 60.

$\frac{5}{2}$ the amount
5 onions (chopped)
$2\frac{1}{2}$ cloves garlic (chopped)
$12\frac{1}{2}$ pounds ground beef
10 cups canned tomatoes
25 cups canned kidney beans
$7\frac{1}{2}$ green peppers (chopped)
5 teaspoons salt
$7\frac{1}{2}$ teaspoons sugar
10 tablespoons chili powder

Drawing a Picture

Problem Solver

SB p. 114

Lesson Objective

- draw pictures to help solve problems

Activity

North, South, East, West

Purpose: extend the ideas in the lesson

Materials

- PCM 22: Drawing a Picture, p. 66
- rulers

What to Do

Distribute a copy of PCM 22 to each student. Have students use their rulers to measure the picture for problem 1 (distance between Division St. and job is 13 blocks). Help them see that it is a scale drawing, and that $\frac{1}{2}$ cm = 1 block. Explain that scale drawings let you find approximate values for unknown distances.

Have students work individually to complete problems 2–4.

Expansion/Reinforcement: Since students are working with right triangles in this activity, you may want to introduce the Pythagorean theorem ($a^2 + b^2 = c^2$) as another method to find the diagonal distance (the hypotenuse).

Dividing Fractions

SB p. 116

Lesson Objectives

- invert a fraction or a whole number
- divide a fraction by a fraction
- divide a fraction by a whole number
- estimate with fractions

Activity

Seeing Is Believing

Purpose: reinforce the ideas in the lesson

Materials

- chocolate bars with 12 sections (one bar for each pair or small group of students)

What to Do

Have students work in pairs or small groups. Distribute the candy bars. Tell students that they can eat the candy once the activity is completed. Walk students through the following questions:

1. *"How many sections is each bar divided into?"* (12) *"What fraction does each section represent?"* ($\frac{1}{12}$) *"How many sections, or twelfths, make up half of the bar?"* (6)
Have students use the candy bars to find the answer. Then have them write and solve an equation that reflects the last question.

fraction of the bar — fraction represented by each section

$\frac{1}{2} \div \frac{1}{12} = \frac{1}{2} \times \frac{12}{1} = 6$ — number of sections in $\frac{1}{2}$ the bar

Using a candy bar as an example, say, *"We found how many sections (fractions of the whole) there are in half of the candy bar. We divided a fraction ($\frac{1}{2}$) by another fraction ($\frac{1}{12}$)."* Point out that the answer is larger than either of the two original fractions. Reinforce the concept of inverting and multiplying by the "dividing fraction."

Have students use the candy bars to answer the following questions. Then have them write and solve equations to match the questions.

2. *"How many sections make up one-third of the bar?"* (4)
$\frac{1}{3} \div \frac{1}{12} = \frac{1}{3} \times \frac{12}{1} = 4$

3. *"How many sections make up one-fourth of the bar?"* (3)
$\frac{1}{4} \div \frac{1}{12} = \frac{1}{4} \times \frac{12}{1} = 3$

4. *"If you have one-fourth of a candy bar, divided into three pieces, what part of the entire bar is each of the three pieces?"* ($\frac{1}{12}$)
$\frac{1}{4} \div 3 = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

Explain that this represents a fraction divided by a whole number. Reinforce the concept of changing the whole number to a fraction and multiplying. Point out that the answer is smaller than the original fraction.

5. *"If you have half of a candy bar and it is divided into six pieces, what part of the entire bar is each of these six pieces?"* ($\frac{1}{12}$)
$\frac{1}{2} \div 6 = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

Dividing with Mixed Numbers

SB p. 118

Lesson Objectives

- divide with mixed numbers
- estimate with mixed numbers

Activity

Dressing up a Dressing

Purpose: introduce the ideas in the lesson

What to Do

Tell students, *"Imagine you are making salad dressing that needs three and three-fourths cups of vinegar. You want to use raspberry vinegar and plain vinegar. From experience, you know that if you use raspberry vinegar for more than one-third of the total amount of vinegar, the dressing will be too tart. How can you find out how much raspberry vinegar to use?"*

Students should realize that they need to divide:

$$3\frac{3}{4} \div 3 = \frac{\overset{5}{\cancel{15}}}{\underset{1}{\cancel{4}}} \times \frac{1}{\cancel{3}} = \frac{5}{4} = 1\frac{1}{4}$$

You can use this problem to help students develop number sense: $3\frac{3}{4}$ is 3 full cups plus $\frac{3}{4}$ cup. So $3\frac{3}{4}$ divided by 3 is the same as 3 full cups divided by 3 plus $\frac{3}{4}$ cup divided by 3. Three full cups divided by 3 is 1 cup; $\frac{3}{4}$ cup divided by 3 is $\frac{1}{4}$ cup. Adding, $1 + \frac{1}{4} = 1\frac{1}{4}$.

Multiply or Divide?

Problem Solver

SB p. 120

Lesson Objective

- recognize whether a problem involves multiplication or division

Activity

What's New, Pussycat?

Purpose: introduce the ideas in the lesson

What to Do

Tell the class, *"A cat gets two-thirds of a can of food each day. There are eight full cans in the pantry. Is*

there more or less than eight days' worth of food? How do you know?" (More than 8 days, because each can of food lasts more than 1 day.)

"Would you multiply or divide to answer this problem?" (Divide, because multiplying 8 times $\frac{2}{3}$ would give a number less than 8, and the number should be more than 8.)

Say, *"Each litter change uses one-quarter bag of litter, and you have two full bags of litter. How can you calculate the number of changes you can make with this amount?"* (Multiply 2×4 or divide 2 by $\frac{1}{4}$.)

"If you change the litter every five days, how many days' worth of litter do you have?" (There are 8 changes, and $8 \times 5 = 40$ days.)

What to Look For

Students should see that number sense, such as knowing that 8 cans of cat food, at $\frac{2}{3}$ can per day, will last more than 8 days, is important to help them use math in their everyday lives.

Multiplication and Division Equations

Tools

SB p. 122

Lesson Objectives

- use a variable to represent an unknown number
- write multiplication and division equations involving fractions and mixed numbers

Activity

More Picturing Equations

Purpose: introduce the ideas in the lesson

Materials

- PCM 23: Picturing Equations #2, p. 67

What to Do

Distribute a copy of PCM 23 to each student. Discuss problem 1, which is done as an example. Then have students complete problems 2 and 3 individually.

What to Look For

Students should be able to describe the relationship between multiplication and division for each problem.

Solving Multiplication and Division Equations

SB p. 124

Lesson Objectives

- understand that multiplication and division are inverse operations
- write and solve one-step multiplication and division equations that contain variables

Activity

More Doing and Undoing

Purpose: introduce the ideas in the lesson

What to Do

Remind students of the different ways to represent multiplication and division in an equation:

$5 \times y$ $\quad 5y$ $\quad 5 \cdot y$ $\quad 5 \div y$ $\quad \frac{5}{y}$

Tell students, *"Suppose the amount of rainfall this month was twenty times the amount last month. Write a math expression for 'twenty times an unknown number.'"*

Ask, *"What will be the same and what will be different about all your written expressions?"* (Students probably used different variables, but all answers should be in one of these three forms: $20 \times y$; $20y$; or $20 \cdot y$.)

Ask, *"What was done to your unknown number?"* (It was multiplied by 20.)

Say, *"Explain what you get if you divide twenty into the expression 'twenty times y.'"* (Students may use specific values for their unknown number to explain that $20 \times y \div 20$ results in the original value of the unknown number.)

Have students form groups. Write on the board

- the amount earned at \$5 per hour for t hours
- an inheritance of M dollars divided equally among 3 people

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Tell each group to

1. write each phrase as a mathematical expression ($\$5 \times t$; $M \div 3$)
2. describe what is done to the unknown number in each expression (t is multiplied by 5; M is divided by 3)
3. explain how to get back to the unknown number (divide the product of $5t$ by 5: $[5 \times t \div 5]$; multiply the quotient of $M \div 3$ by 3: $[M \div 3 \times 3]$)

Fractions and Your Calculator

Tools

SB p. 126

Lesson Objectives

- use a calculator to convert fractions to decimals
- add and multiply fractions

Activity

Choose the Best Way

Purpose: reinforce the ideas in the lesson

Materials

- calculators

What to Do

Write the following fractions on index cards: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{5}{12}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{7}{9}$, $\frac{4}{5}$, and $\frac{5}{6}$. Place the cards facedown on a desk at the front of the room.

Select two cards at random and have the students add them using paper and pencil. Then have students add them using a calculator. Select two more cards and have the students multiply them, first with pencil and paper and second with a calculator. Ask, *"When is a calculator helpful? When is it better to use pencil and paper?"*

Continue drawing cards and asking students to add or multiply the fractions. Allow students to choose whether or not to use calculators.

Using the Casio *fx*-260 for the GED

The Casio calculator can be used to solve fraction problems without first converting fractions to decimals. Refer students to the Tool Kit, page 240, for more information.

Fractions and Money

Application

SB p. 128

Lesson Objectives

- change a fraction to a decimal
- round a decimal to hundredths
- solve problems that involve fractions and money

Activity

Circle Graphs

Purpose: extend the ideas in the lesson

Materials

- PCM 24: Circle Graphs, p. 68
- scissors
- calculators

What to Do

Distribute a copy of PCM 24 to each student. Have students cut out the protractor. Show them how to use a protractor to measure angles. Ask, *"How many degrees are there in a right angle? In a straight line? In a circle?"* (90 degrees, 180 degrees, 360 degrees)

Draw a circle. Ask, *"How can you show a wedge or pie-shaped piece of a circle that represents two-sevenths of the circle?"* (Possible methods: use a calculator to find $\frac{2}{7}$ of 360 [about 103] and use the protractor to draw the wedge; or find $\frac{1}{7}$ of a full circle, which is about $51\frac{1}{2}$ degrees, and double it.)

Have students form groups to create the circle graphs for PCM 24.

Gridding in Fraction Answers

Tools

SB p. 130

Lesson Objective

- grid fractions and mixed numbers

Activity

Fabric Scraps

Purpose: reinforce the ideas in the lesson

Materials

- PCM 5: Five-Column Grids, p. 49
- calculators (optional)

What to Do

Present the following situation to the students. Quilts are often made from leftover pieces of fabric. Fabric is measured in yards. Sarah has the following lengths of fabric scraps: $\frac{5}{8}$, $2\frac{2}{3}$, $1\frac{5}{6}$, $2\frac{3}{4}$, $\frac{7}{16}$, $1\frac{1}{5}$, $\frac{1}{4}$, $2\frac{3}{8}$, and $1\frac{1}{3}$ yards. Arrange the lengths of the scraps in order from least to greatest and grid in the amounts on grids 1 through 9 on PCM 5.

If students need more practice using calculators, they can compare fractions by changing them to decimals using division or the fraction key $a\frac{b}{c}$ found on the Casio *fx*-260 and most scientific calculators.

Remind students that they must grid mixed numbers as improper fractions.

Answers:

1. 1/4	4. 6/5	7. 19/8
2. 7/16	5. 4/3	8. 8/3
3. 5/8	6. 11/6	9. 11/4

Using the Casio *fx*-260 for the GED

You can change mixed numbers to improper fractions using the *d/c* function. Enter the mixed number, then press SHIFT and $a\frac{b}{c}$.

Ratio and Proportion

Unit Overview

The purpose of this unit is to explore ratio and proportion. Students will learn how to interpret, write, and use ratios; how to write and solve proportions; and how to use proportions in word problems and scale drawings.

When Do I Use Ratio and Proportion?

page 135

Have students complete the checklist and answer the questions individually. As a class, discuss these and other real-life situations that involve ratio and proportion. Ask students where they learned about ratio and proportion. Have students look over the table of contents for unit 4 and talk about how the lessons reflect their everyday uses of ratio and proportion.

Talk About It page 135

After brainstorming and making a list, discuss the units for each of the ratios in the list. Discuss how often *costs* appear in ratios (number of items per dollar, number of dollars per item), or how often other categories appear (lengths, capacities, and so on). Finally, talk about how and when students compare ratios and why comparing ratios is useful. Look ahead in the unit to the *Unit Rates* lesson on student book page 142.

Working Together page 157

Have students discuss how they would deal with items that overlap categories. For example, if a student has one brown eye and one green eye, which is their eye-color category? Ask students to think of other examples, find solutions, and explain their solutions to the class.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
Fractions and Ratios	136	33	Communication	
Writing a Ratio	138	33	Cooperative Learning	25
Ratios and Patterns	140	33	Reasoning	
Unit Rates	142	34	Reasoning	
Understanding Proportion	144	34	Hands-On	26
Making a Table	146	35	Reasoning	
Solving Problems with Proportions	148	35	Cooperative Learning	
Gridding in Ratio and Proportion Answers	150	36	Grid Activity	5
Calculators and Proportion Problems	152	36	Hands-On	
Scale Drawings and Maps	154	36	Hands-On	27

Fractions and Ratios

SB p. 136

Lesson Objectives

- understand ratios
- write a ratio three ways
- simplify ratios

Activity

Counting Coins

Purpose: introduce the ideas in the lesson

What to Do

Ask students to count the number of different coins they have with them. On the board, fill in a chart like this with class totals:

Pennies	Nickels	Dimes	Quarters	Half Dollars	All Coins
75	23	7	9	3	117

Ask a volunteer to compare the number of pennies to nickels. Write the comparison on the board (75 to 23). Explain that "75 to 23" is a ratio, or a comparison of two numbers.

Ask students to state other ratios from the chart. *"What is the ratio of dimes to all coins?"* (7 to 117) *"What is the ratio of all coins to pennies plus quarters?"* (117 to 84)

Reverse the questions. Ask, *"What ratio is nine to twenty-three?"* (quarters to nickels) and *"What ratio is one hundred five to ten?"* (pennies, nickels, and dimes to dimes and half dollars).

Variation: If counting coins will not work well with your class, use other items, such as pencils, erasers, and felt-tip and ballpoint pens.

Writing a Ratio

SB p. 138

Lesson Objectives

- write ratios with the numbers in correct order
- convert units to write ratios that use the same units

Activity

Some of the Parts

Purpose: introduce the ideas in the lesson

Materials

- PCM 25: Writing a Ratio, p. 69
- large and small paper clips (or other two-sized or two-colored items)

What to Do

Draw 5 circles and 2 squares on the board. Have the class answer and discuss these questions:

1. *"What is the ratio of circles to squares?"* (5 to 2)
2. *"What is the ratio of squares to circles?"* (2 to 5)
3. *"What is the ratio of figures to circles?"* (7 to 5)
4. *"What is the ratio of squares to figures?"* (2 to 7)

Ask, *"If you have triangles and rectangles, and the ratio of triangles to figures is seven to ten, how could you find the ratio of rectangles to figures?"* (Since 7 of the 10 figures are triangles, there are 3 rectangles. The ratio is 3 to 10.)

Distribute copies of PCM 25 and paper clips to all students. Do Part 1 as a class. Have students work through Part 2 in small groups. For each situation one ratio is given, and students should write the five other ratios. They can use the large and small paper clips to represent object A and object B.

Ratios and Patterns

SB p. 140

Lesson Objectives

- find equivalent ratios
- explore number patterns using ratios

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Activity

What's the Scoop?

Purpose: introduce the ideas in the lesson

What to Do

Write this chart on the board:

scoops of mix	2	4	6	?
cups	1	2	?	4

Say, *"Two scoops of hot chocolate mix makes one cup of hot chocolate. How many cups does four scoops make?"* (2) *"Six scoops?"* (3) *"How many scoops does it take to make four cups of hot chocolate?"* (8)

Extend the chart, finding ratios for additional cups of hot chocolate until students are comfortable with the pattern shown.

Unit Rates

Application

SB p. 142

Lesson Objectives

- understand rate as a ratio with 1 as the denominator
- find unit rate and unit price

Activity

Racing Speed

Purpose: introduce the ideas in the lesson

What to Do

Write *velocity* on the board. Define it for students (rate of movement per time). Ask, *"What combinations of units measure velocity?"* Examples could include $\frac{\text{miles}}{\text{hour}}$ and $\frac{\text{inches}}{\text{second}}$. Write the examples on the board.

Ask, *"For these ratios, how are the numerators alike, and how are the denominators alike?"* (The numerators all measure distance, the denominators all measure time.)

Ask, *"If a marathon runner traveled twenty-six miles in four hours, how can you find her unit rate in miles per hour?"* (Rewrite $\frac{26}{4}$ as a fraction with denominator 1. $\frac{26 \text{ miles}}{4 \text{ hours}} = \frac{6.5 \text{ miles}}{1 \text{ hour}} = 6.5$ miles per hour)

Understanding Proportion

SB p. 144

Lesson Objectives

- recognize a proportion as two equal ratios
- use cross products to solve a proportion for an unknown
- recognize similar figures as being in proportion

Activity

Ratios of Distances

Purpose: apply the ideas in the lesson

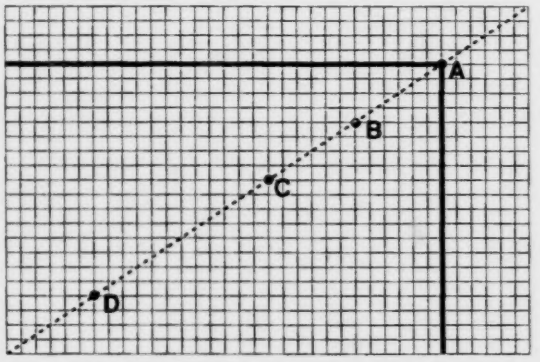
Materials

- PCM 26: Understanding Proportion, p. 70

What to Do

Have students form small groups. Distribute a copy of PCM 26 to each group. Do question 1 as a class by asking, *"How can you write the length to width ratio of the rectangle?"* ($\frac{36}{24}$ is shown in number 1 on the PCM.)

To start question 2, tell students *"Draw a horizontal line and a vertical line at point A to make another rectangle, so your diagram looks like this."*



Have students measure the length and width of their new rectangle and write the $\frac{\text{length}}{\text{width}}$ ratio. Compare and discuss the two ratios. (They are equal.) Then have students do the rest of PCM 26.

What to Look For

Students should see that the ratios for all the rectangles are equal, and the rectangles are similar figures.

Making a Table

Problem Solver

SB p. 146

Lesson Objectives

- organize information in a table
- write and solve proportions

Activity

New Money, Old Money

Purpose: introduce the ideas in the lesson

What to Do

Draw this table on the board:

	2000s	1990s	1980s	Pre-1980	Totals
Pennies					
Nickels					
Dimes					
Quarters					

Have students separate the coins they have into pennies, nickels, dimes, and quarters. Then have them separate each group according to the decade each coin was made.

Fill in the table with the class totals. Say, *"Suppose we call coins minted in the two thousands 'new' coins. What is the ratio of new quarters to all quarters?"* Ask other questions to give students practice reading and finding sums of columns and rows in a table.

Solving Problems with Proportions

SB p. 148

Lesson Objectives

- use proportions to represent situations in word problems
- write and solve proportions

Activity

What's the Problem? What's the Answer?

Purpose: apply the ideas in the lesson

What to Do

On the board, write a proportion with an unknown, such as $\frac{5}{8} = \frac{s}{32}$. Ask a volunteer to make up a problem that this proportion can represent. For example, if 5 students need 8 pieces of paper, how many students would use 32 pieces of paper?

Have the class solve the proportion. ($8 \times s = 160$, $s = 20$; 20 students would use 32 pieces of paper.)

Have students form small groups. Write the following three problems on the board or a flip chart:

1. $\frac{5}{1} = \frac{45}{w}$
   If each new car sold has 5 tires, then . . .
   (how many cars would 45 tires supply?)

2. $\frac{x}{3} = \frac{4}{24}$
   If a recipe that serves 24 people uses 4 tablespoons of hot sauce, then . . .
   (how many tablespoons of hot sauce would you need to serve 3 people?)

3. $\frac{45}{y} = \frac{10}{18}$
   If it takes 10 minutes to check the air pressure of all 18 tires on a large truck, then . . .
   (how many tires can be checked in 45 minutes?)

For each problem, the group should complete the problem statement using the numbers in the proportion, then solve the proportion and explain the answer. (Answers: 9 cars; $\frac{1}{2}$ tablespoon; 81 tires)

What to Look For

Be sure students' problems compare numbers in the same order as the proportion, so their ratios have corresponding units in the numerators and denominators.

Gridding in Ratio and Proportion Answers

Tools

SB p. 150

Lesson Objective

- fill in answers to ratio and proportion problems on a five-column grid

Activity

Softball Stats

Purpose: reinforce the ideas in the lesson

Materials

- PCM 5: Five-Column Grids, p. 49

What to Do

Distribute a copy of PCM 5 to each student. On the board, write these statistics for a ball player.

Games Played	5
At Bats	25
Hits	12
Walks	6
Strikeouts	3
Singles	9
Doubles	2
Triples	0
Home Runs	1

Have each student write one ratio and one proportion question based on the data. Select nine questions, read them to the class, and have students grid in the answers in lowest terms on PCM 5.

Examples

1. What is the ratio of strikeouts to walks? (3/6 = 1/2)
2. At this rate, if the player plays 50 games, how many doubles will she hit? ($\frac{2}{5} = \frac{x}{50}$ and $2 \times 50 \div 5 = 20$)

What to Look For

As students work, check grids for accuracy. Not all tests require students to simplify fractions and ratios. If students are preparing for a specific test, check the requirements for that test.

Calculators and Proportion Problems

Tools

SB p. 152

Lesson Objectives

- use a variable to represent an unknown number
- use a calculator to solve proportions

Activity

On Your Mark, Get Set, Keypress!

Purpose: apply the ideas in the lesson

Materials

- calculators
- clock with second hand (visible to all students)

What to Do

Say, *"I will write a proportion on the board, and you will solve it to the nearest hundredth. Use your calculators. When you find the solution, record your time. See if you can beat your own best speed."*

When the second hand on the clock approaches 12, write a proportion such as $\frac{5.07}{18.9} = \frac{y}{7.23}$. Have students solve it. (Students should multiply 5.07×7.23, then divide that product by 18.9. $y = 1.94$)

Repeat. Use the same numbers, but vary their positions and use different variables.

Scale Drawings and Maps

Application

SB p. 154

Lesson Objectives

- use proportions to interpret scale drawings
- use proportions to find approximate distances on a map

Activity

Where Are We?

Purpose: apply the ideas in the lesson

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Materials

- PCM 27: Where Are We?, p. 71
- road maps with scale
- rulers

What to Do

Have students form small groups. Distribute a copy of PCM 27 to each student and a road map to each group. As a class, choose two locations on one map and complete the top row of Part 1 on the PCM. Then have each group complete the rest of Part 1, using their own maps. Tell students to measure the distances along roads.

For Part 2, each group selects two locations on their map. Students should describe three different ways to get from one location to the other, then use the map to find the total driving distance for each route.

Unit 5

Percents

Unit Overview

The purpose of this unit is to explore percents. Students will convert percents, decimals, and fractions; use and solve the percent statement; apply percents in statistics and discounts; solve two-step problems using percents; and find the percent of increase and decrease.

When Do I Use Percents? page 159

Have students complete the checklist and answer the questions individually. As a class, discuss these and other real-life situations that involve percents. Ask students where they learned to work with percents. Have students look over the table of contents for unit 5 and discuss how the lessons reflect their everyday uses of percents.

Talk About It page 159

After talking about students' questions, make a class list of all the questions that can help students use percent to be better shoppers. Discuss words that mean a percent or amount is being *taken off* a price (*sale, discount, coupon*) and words that mean a percent or amount is being *added to* a price (*tax, tip, delivery charge*).

Working Together page 191

Have students name some common discounts (10% off, 20% off, $\frac{1}{3}$ off). Discuss situations in which stores offer the biggest discounts (liquidation or out-of-business sales; after-Christmas sales on cards and wrapping paper; sales on damaged items). Also, ask students to explain why "up to $\frac{1}{2}$ off" does not mean that all items are 50% off.

Activity Overview

To find general information about *Math Sense*, including scope and sequence charts, see www.math-sense.com.

Student Book Lesson	Pages in SB	Pages in TRG	Activity Type	PCM Number
Understanding Percents	160	39	Hands-On	2
Estimating the Size of Percents	162	39	Hands-On	2
Changing Decimals and Percents	164	40	Hands-On	28
Changing Fractions and Percents	166	40	Communication	
The Percent Statement	168	40	Reasoning	
Does the Answer Make Sense?	170	41	Reasoning	
The Percent Equation	172	41	Cooperative Learning	29
Solving a Percent Equation	174	41	Hands-On	30
Gridding in Percent Answers	176	42	Grid Activity	5, 31
Statistics and Percents	178	42	Reasoning	
Using a Calculator with Percents	182	43	Communication	
Two-Step Percent Problems	184	43	Cooperative Learning	32
Discounts	186	43	Reasoning	33
Percent of Increase/Decrease	188	44	Reasoning	

Understanding Percents

SB p. 160

Lesson Objectives

- explore the meaning of *percent*
- write a percent as a fraction and as a decimal

Activity

And Then There Were None

Purpose: introduce the ideas in the lesson

Materials

- PCM 2: Tenths and Hundredths Grids, p. 46

What to Do

Distribute copies of PCM 2. Have each student shade in five squares on a hundredths grid. Ask, *"What fraction of the total is shaded?"* ($\frac{5}{100}$) *"What fraction of the total is not shaded?"* ($\frac{95}{100}$) *"Percent means 'per hundred,' so another way to write these fractions is five percent and ninety-five percent."*

Give students other amounts to shade in on the other hundredths grids. Have them write the percents of shaded and unshaded boxes.

Estimating the Size of Percents

SB p. 162

Lesson Objectives

- estimate the size of percents
- recognize percents greater than 100%

Activity

How Much?

Purpose: introduce the ideas in the lesson

Materials

- PCM 2: Tenths and Hundredths Grids, p. 46

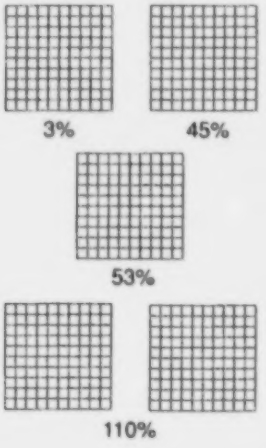
What to Do

Distribute two copies of PCM 2 to each student. Have them shade in 30 squares on a hundredths grid.

Ask, *"How can you decide if the percent shown is more or less than one-half?"* Explain that 30% is less than $\frac{1}{2}$ because $50\% = \frac{1}{2}$ and $30\% < 50\%$.

Have students complete steps 1 and 2 individually.

1. Tell students to shade boxes in the remaining five hundredths grids to represent the following percents: 3%, 45%, 53%, and 110%. Students will have to use the last two grids to represent 110%. Students' grids should look like the ones below. Students may shade different boxes, but the number of shaded boxes should be the same.



2. Next, have students write each amount as a percent and as a fraction. They can write their answers next to each grid.

   3%, $\frac{3}{100}$ 53%, $\frac{53}{100}$

   45%, $\frac{45}{100}$ 110%, $\frac{110}{100}$

3. In pairs or small groups, have students answer these questions about their results:

   (for 3%) *"Is this amount greater than zero? Is it close to one-half?"*

   (for 45%) *"Is this amount close to one-half? How do you know?"*

   (for 53%) *"Is this amount greater than one-half? How do you know?"*

   (for 110%) *"Is this amount greater than one? How do you know?"*

Changing Decimals and Percents

SB p. 164

Lesson Objective

- interchange percents and decimals by moving the decimal point

Activity

Decimal War

Purpose: apply the ideas in the lesson

Materials

- PCM 28: Card Deck #3, p. 72
- scissors

What to Do

Distribute a copy of PCM 28 to each student. Have students cut out their own deck of 16 cards.

Have students form pairs and play "War." (For a review of the rules, see page 11.)

For each contest, students can decide whether the lower value or the higher value will win.

What to Look For

Students should realize that these cards have equal values:

$25\% = .25 = .250 = 25.0\%$

$2.5 = 2.50 = 250\% = 250.0\%$

$2\frac{1}{2}\% = 2.5\% = .025 = .0250$

$10\% = .10$

$50\% = .50$

Changing Fractions and Percents

SB p. 166

Lesson Objectives

- write a percent as a fraction
- write a fraction as a percent
- recognize commonly used fractions, decimals, and percents

Activity

Ideal Apartment for Rent

Purpose: extend the ideas in the lesson

Materials

- calculators

What to Do

Have students tell you a sample monthly rent for studios, one-bedroom apartments, and three-bedroom apartments. Write the numbers on the board as follows:

	Studio	1 BR	3 BR
rent:	$350	$550	$975

Tell the class, *"Each of these apartments is getting a rent increase of fifty dollars per month. Does this across-the-board increase seem fair for all three apartments?"*

Explain how to find 10% of a number. Use as an example that 10% of 270 is 27. Ask the class to describe whether each rent increase is greater than or less than a 10% increase. Using the numbers above, 10% increases would be $35, $55, and $97.50, so only the studio's rent increase is more than ten percent.

Show students how to use a calculator to convert a fraction to a decimal. Then ask them to find the percent rent increase for each of the three apartments. ($\frac{50}{350} \approx 14\%, \frac{50}{550} \approx 9\%, \frac{50}{975} \approx 5\%$)

The Percent Statement

SB p. 168

Lesson Objectives

- use the percent statement
- identify the missing element in percent problems

Activity

How Many Times?

Purpose: introduce the ideas in the lesson

Materials

- calculators

What to Do

On the board, write:

"% of the whole is equal to the part"

Help students generate examples to fit this statement and write them on the board in the form of percent statements. For example, in a class of 10 students, 3 are male. Write: "30% of 10 is equal to 3. So, 70% of 10 is equal to 7."

Tell students that the sentences on the board are called *percent statements.*

Does the Answer Make Sense?

Problem Solver

SB p. 170

Lesson Objective

- recognize when an answer is not sensible

Activity

Checking the Check

Purpose: introduce the ideas in the lesson

Materials

- calculators

What to Do

Write this restaurant check on the board:

2 lunch specials @ $8.00	
$160.00	$160.00
Service (15%) $24.00	24.00
Pay this amount $184.00	$184.00

Have students use calculators to show that 15% of $160 is $24. Then ask them to explain the error on the check. (2 × $8.00 = $16.00; the tip was calculated on the wrong amount.)

Write out another check they might receive:

5 lunch specials @ $7.00	
$35.00	$35.00
Service (15%) $15.00	15.00
Pay this amount $20.00	$20.00

Use a calculator to show that 15% of $35 is $5.25. Then ask students to explain any errors on this check. (15% of $35 ≠ $15; the tip was subtracted, not added; the total should be $40.25.)

The Percent Equation

SB p. 172

Lesson Objectives

- change a percent statement to a percent equation
- write a percent equation using a variable
- read a circle graph

Activity

Make Up the Question

Purpose: apply the ideas in the lesson

Materials

- PCM 29: Make Up the Question, p. 73
- calculators

What to Do

Distribute a copy of PCM 29 to each student. Say, *"In row one, make up a value for the original price of a turtleneck sweater."* Suppose a student suggests $50. Ask, *"How can you calculate the savings and the sale price?"* (savings = 35% of $50 = $17.50; sale price = $50 − $17.50 = $32.50).

Have students work in groups to make up values for the shaded boxes in each row. Then they should calculate values for the other boxes in the row.

Solving a Percent Equation

SB p. 174

Lesson Objective

- write and solve percent equations

Activity

The Part and the Whole

Purpose: apply the ideas in the lesson

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Materials

- PCM 30: Solving a Percent Equation, p. 74
- large and small paper clips
- calculators

What to Do

Have students form small groups. Distribute a copy of PCM 30 to each student. Give each group a handful of small paper clips and a different number of large paper clips. Have each group discuss and solve the six problems in number 1. As a class, discuss number 2.

Gridding in Percent Answers

SB p. 176

Lesson Objectives

- fill in answers to percent problems on a five-column grid
- use data from circle graphs to solve problems

Activity

Make Sense of Data

Purpose: reinforce the ideas in the lesson

Materials

- PCM 5: Five-Column Grids, p. 49
- PCM 31: Make Sense of Data, p. 75

What to Do

Give each student a copy of PCM 5. You may display PCM 31 on an overhead or make copies for students. Point out that the graphs shown on PCM 31 are similar to those printed in newspapers and magazines.

Remind students that the entire circle represents the whole, or 100%, and each wedge represents a part of the whole.

Have students solve the problems on PCM 31 and grid in the answers on PCM 5.

What to Look For

Make sure students use grids correctly. Students should not use commas or dollar signs when they write their answers at the top of a grid.

Statistics and Percents

SB p. 178

Lesson Objectives

- understand *statistics*
- use percents to create statistics
- label a circle graph

Activity

Comparing Percents

Purpose: extend the ideas in the lesson

Materials

- calculators

What to Do

Write the following chart on the board:

	# in class	# in school
total students	30	150
brown-eyed students	18	87

Ask students to use this data to find

- percent of brown-eyed students in class ($\frac{18}{30}$ = 60%)
- percent of brown-eyed students in school ($\frac{87}{150}$ = 58%)

Discuss the fact that 60% is greater than 58% even though there are fewer brown-eyed students in the class than in the entire school. Ask students to explain the apparent contradiction.

Expansion/Reinforcement: Have students make a chart of the number of people in class who have brown, blue, green, or other color eyes. Figure percents and compare.

Using a Calculator with Percents

Tools

SB p. 182

Lesson Objectives

- use the percent key on a calculator
- use a calculator to solve percent problems

Activity

Buy Low, Sell High

Purpose: introduce the ideas in the lesson

Materials

- calculators

What to Do

Tell students to think about running a secondhand store, where they buy old items, fix them up, and sell them at a profit.

Ask, *"If an item costs you ten dollars to buy and fix up, and you sell it for twenty-two dollars, how can you express the profit to cost ratio as a percent?"* (The profit is \$12; the profit-cost ratio is $\frac{12}{10}$. $\frac{12}{10}$ = 120%.)

Say, *"Suppose an item costs twenty-five dollars to buy and fix up and you want to make the same one hundred twenty percent profit. How can you calculate the selling price?"* Students should give the following series of answers:

$\frac{\text{profit}}{\text{cost}}$ = 120% = 1.20

$\frac{\text{profit}}{\$25}$ = 1.20

profit = \$25 × 1.20 = \$30

profit + cost = selling price

\$30 + \$25 = \$55

Let students supply the cost and the percent for the profit-cost ratio for three or four other items, and calculate the selling prices.

Using the Casio *fx*-260 for the GED

On the Casio calculator, the percent key is the second function of the [=] key. To access percent, press [SHIFT] and then [=].

Two-Step Percent Problems

SB p. 184

Lesson Objective

- analyze and solve two-step percent problems

Activity

Two-Step Percent Problems

Purpose: apply the ideas in the lesson

Materials

- PCM 32: Two-Step Percent Problems, p. 76
- overhead transparency of PCM 32 and marker
- scissors
- index cards or pieces of paper (10 per group)
- calculators

What to Do

Write this chart on the board:

Deck 1	Deck 2	Deck 3
30% off	\$10 added discount	8% tax
20% off	$\frac{1}{5}$ added discount	10% tax
\$15 off	\$15 added discount	5% tax
$\frac{1}{5}$ off		

Ask students to work in groups. Have each group make three small decks of cards, copying Deck 1, Deck 2, and Deck 3 onto index cards or pieces of paper. Tell them to keep the decks separate.

Distribute a copy of PCM 32 to each group. Use the transparency and an overhead projector to walk students through shopping trip 1. Tell students, *"Suppose you have been shopping, and the cost of your items is one hundred seventy-five dollars. At the checkout counter, the cashier hands you the fifteen-dollar-off card from deck one, the one-fifth added-discount card from deck two, and the eight-percent-tax card from deck three. Figure the cost at each step."*

cost of items = \$175

minus \$15 off = \$160

minus $\frac{1}{5}$ added discount = \$128

plus 8% tax = \$138.24

Have groups complete the chart on their own and share their results with the whole class.

Expansion/Reinforcement: As students become comfortable filling out the chart, ask them to consider these questions:

1. *Your items cost one hundred dollars and you have cards for both twenty percent off and fifteen dollars off. Does it make a difference in which order the cards are used?* (Yes. If you take 20% off first then $15 off, the final cost is $65; if you take $15 off first then 20% off, the final cost is $68.)

2. *Your purchase is one hundred dollars and you have cards for both thirty percent off and twenty percent off. Does it make a difference in which order the cards are used?* (No; the final cost is $56 either way.)

Discounts

Application

SB p. 186

Lesson Objectives

- use two-step percent problems to find a discount price
- use another method to find a discount price

Activity

Shopping for the Perfect Outfit

Purpose: apply the ideas in the lesson

Materials

- PCM 33: Finding Discounts, p. 77
- calculators

What to Do

Write on the board:

	Price	Discount
Sweater A	$39.95	25%
Sweater B	$34.25	15%
Sweater C	$45.00	$15

Ask, *"Which sweater has the lowest sale price? Explain your answer."*

Sweater A: $39.95 − $9.99 = $29.96
Sweater B: $34.25 − $5.14 = $29.11
(lowest sale price)
Sweater C: $45 − $15 = $30.

Have students form small groups. Distribute a copy of PCM 33 to each student. Say, *"You want to buy a complete outfit—shoes, slacks, shirt, and sweater. The maximum amount you can spend, before sales tax, is one hundred fifty dollars."* Have students fill in the PCM.

Percent of Increase/Decrease

SB p. 188

Lesson Objectives

- find a percent of increase or decrease
- recognize the difference between a percent and a percent of change

Common Difficulties

When students use the percent equation for percent of increase problems, they may mistakenly use the *final value* rather than the *original value* as the whole.

Activity

Change the Price

Purpose: introduce the ideas in the lesson

What to Do

Write these headings on the board:

Types of Decreases

Types of Increases

Ask students for examples for each heading. Write students' answers under the appropriate heading, and discuss some common percents for that type of decrease or increase. Some examples of decreases might include sales, coupons, and employee discounts. Examples of increases could be sales tax, delivery charges, rent increases, and salary raises.

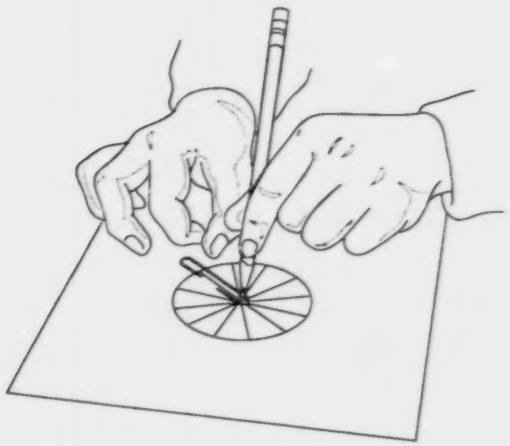
After the discussion, you can make the transition to the lesson by telling students that they can use the percent equation to describe either an increase or a decrease.

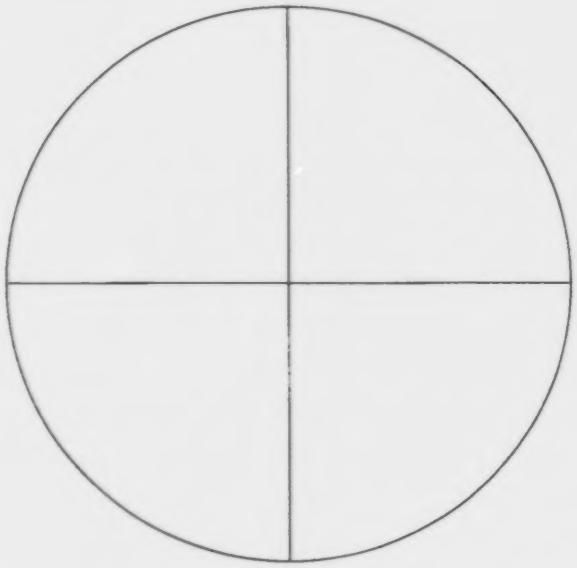
PCM 1

Spinners

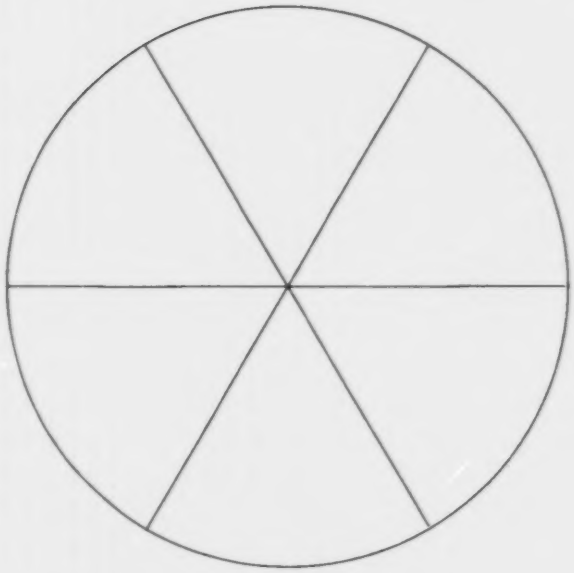
Label the sections of the spinners according to your teacher's directions.

To use a spinner, partially open a paper clip and place one end at the center of the spinner. Hold it in place with the point of a pencil. Flick the other end of the paper clip to spin it. If the paper clip lands on a line, spin again.

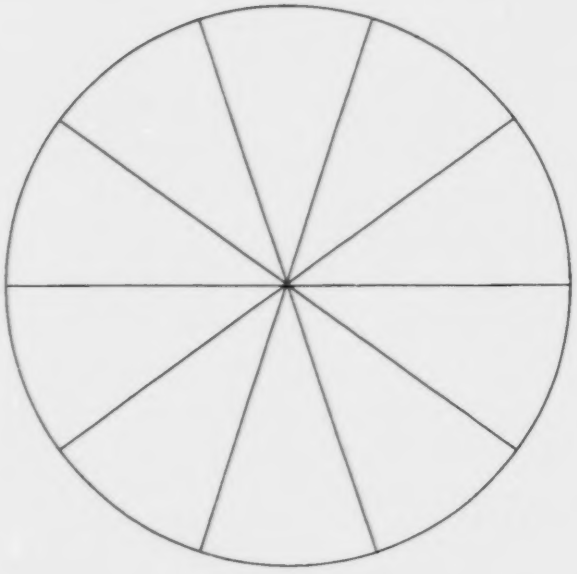




4-part spinner



6-part spinner



10-part spinner

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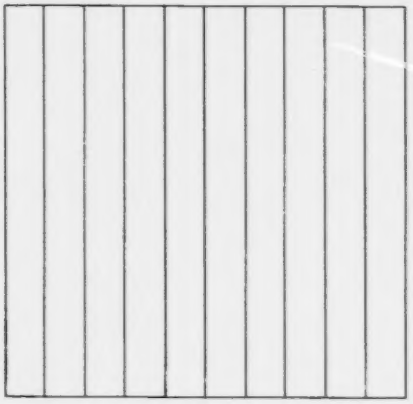
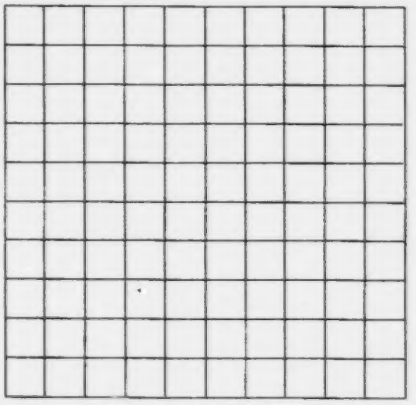
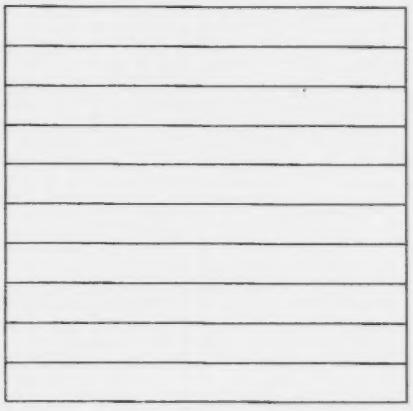
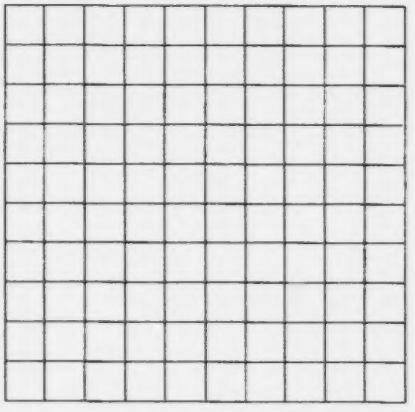
PCM 2

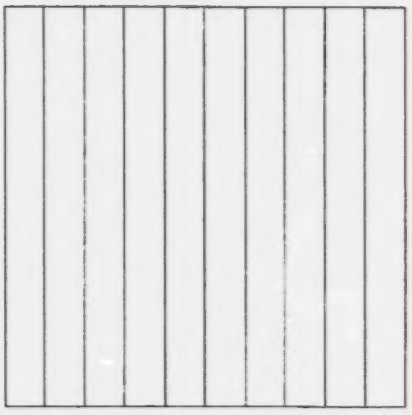
Tenths and Hundredths Grids

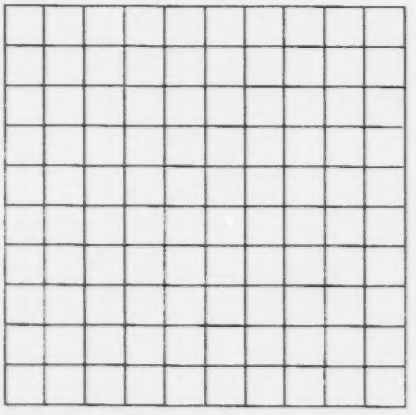












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PCM 3

How to Get Back?

	A. Think of a number. (Do not show it!)	B. Tell what you did to the hidden number.	C. What is the calculator result?	D. How can you get back to the hidden number?	E. What is the hidden number?
1	3.8	added 6.5	10.3	subtract 6.5	
2		multiplied by 1.7	7.225		
3					
4					
5					
6					
7					
8					

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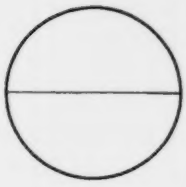
Fraction Figures

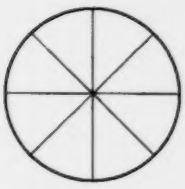
Your Fraction: —


A

B

C

D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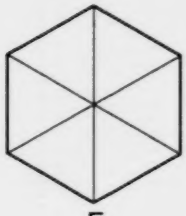
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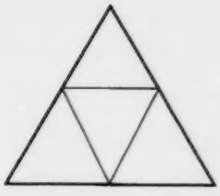
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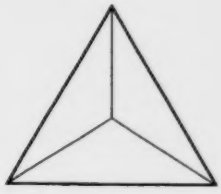
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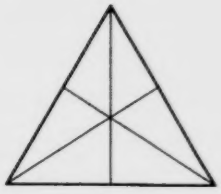
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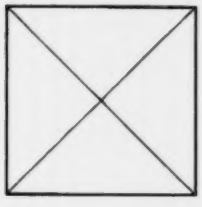
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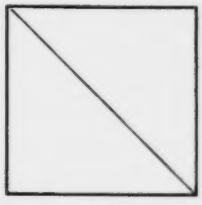
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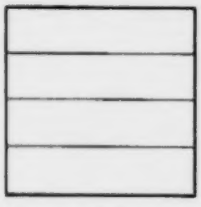
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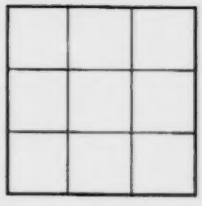
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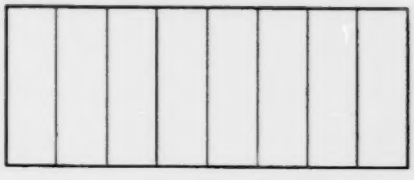
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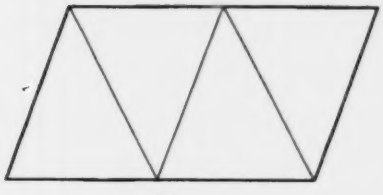
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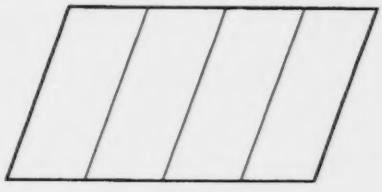
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R

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PCM 5

Five-Column Grids

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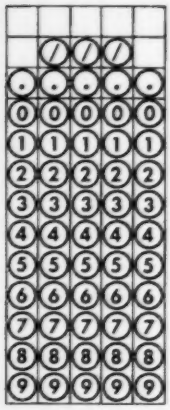

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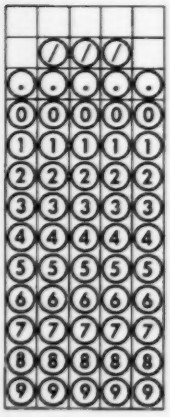

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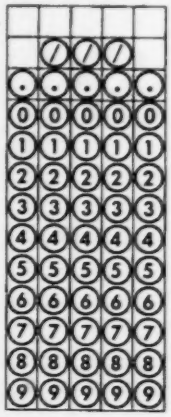

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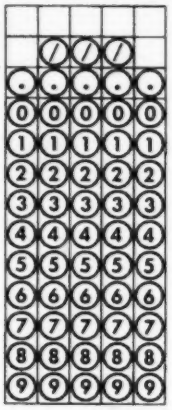

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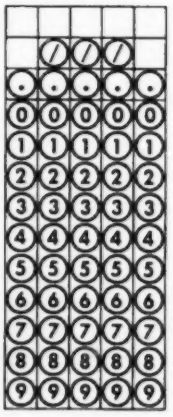

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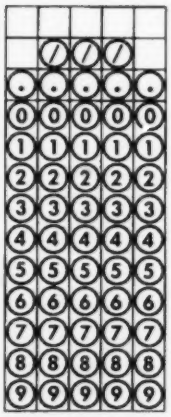

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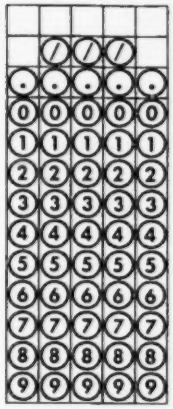

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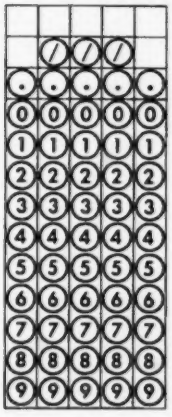

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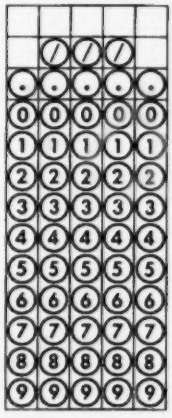

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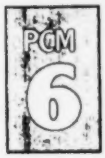

Greater Than $\frac{1}{2}$

Rules of the Game

1. Use your cards to make five proper fractions and four decimal numbers.
2. The winner is the player with the most answers with a value greater than $\frac{1}{2}$.
3. You must use all your cards. Use each card only once.

Fractions: Use <u>two cards</u> to form each fraction.

1. $\frac{\square}{\square}$ 2. $\frac{\square}{\square}$ 3. $\frac{\square}{\square}$ 4. $\frac{\square}{\square}$ 5. $\frac{\square}{\square}$

Decimals: Use <u>one to three cards</u> to form each decimal number. Note that there will not be enough cards to make all of the decimal numbers three digits.

6. $\bullet\ \square\square\square$

8. $\bullet\ \square\square\square$

7. $\bullet\ \square\square\square$

9. $\bullet\ \square\square\square$

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PCM 7

Card Deck #1

Cut out these cards and initial the back of each one.

5%	25%	$\frac{1}{2}$	.05
$\frac{3}{6}$	50%	.25	.50
.5	$\frac{1}{4}$	$\frac{1}{20}$	$\frac{5}{100}$
$\frac{25}{100}$	$\frac{50}{100}$	$\frac{3}{60}$	$\frac{2}{8}$

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PCM 8

Reimbursing a Property Manager

Description	Property 1 41 Michigan St.	Property 2 819 Erie Blvd.	Property 3 5 Ontario St.	Amount
replacement glass	X			$12.79
extra lobby keys			X	$7.50
mailbox labels		X		$12.25
lightbulbs, cleaning supplies			X	$22.80
lightbulbs, cleaning supplies		X		$19.11
lawn care supplies			X	$15.50
outdoor furniture		X		$70.58
gas for grill		X		$12.77
newspaper ad		X		$45.00
newspaper ad	X			$22.50
newspaper ad			X	$22.50
painting supplies	X			$35.10

Totals:

Property 1	Property 2	Property 3	Total Expenses

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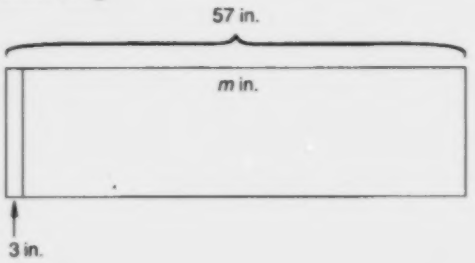
PCM 9

Picturing Equations #1

1. In her workshop, Jade took a 57-inch board and cut off 3 inches from one end. The remaining piece was m inches long.

$3 + m = 57$
$m + 3 = 57$

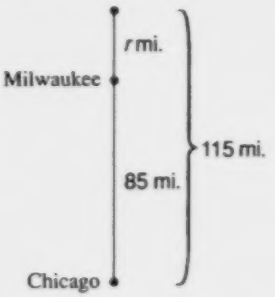
$57 - 3 = m$
$57 - m = 3$



2. Casey drove 85 miles from Chicago to Milwaukee. Then he drove another r miles. His total trip was 115 miles.

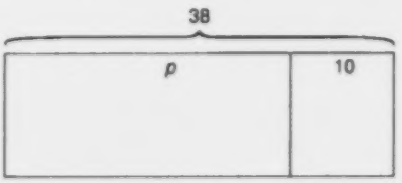
$85 + r = 115$
$r + 85 = 115$

$115 - r = 85$
$115 - 85 = r$



For each of the following problems, write two addition equations and two subtraction equations. (*Note:* there are "extra" numbers in problems 5 and 6.)

3.



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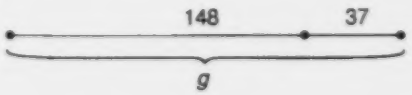

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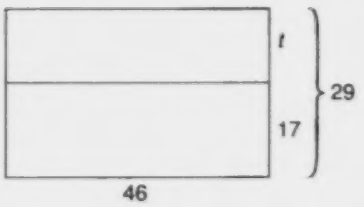

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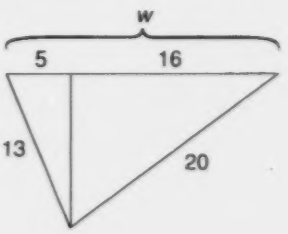

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PCM 10

Finding the Balance

	Property 1		Property 2		Property 3	
	Charges	Total	Charges	Total	Charges	Total
		1,000.00		1,000.00		1,000.00
January	56.95	943.05	0.00	1,000.00	39.99	960.01
February	88.25	854.80	125.00	875.00	0.00	960.01
March	50.00	804.80	50.00	825.00	50.00	910.01
April	50.00	754.80	50.00	775.00	50.00	860.01
May	251.40	503.40	78.99	696.01	251.40	608.61
June	0.00	503.40	56.95	639.06	78.99	529.62
July	39.99	463.41	82.55	556.51	0.00	
August	125.00	338.41	12.29	544.22	70.39	
September	0.00	338.41	12.29		56.95	
October	78.99	259.42	39.99		174.03	
November	82.55		174.03		50.90	
December	70.39		159.71		68.30	
FINAL BALANCE						

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PCM 11

Decimal Weights

3.6 kg	7	9.2 lb.
5	12.5 lb.	0.48 kg
1.9 kg	4.7 g	4
6	2.45 oz.	2.5 g
1.75 lb.	0.15 g	14.6 lb.
42.6 g	10	22.5 oz.
1.3 oz.	8.08 kg	1.025 lb.
1.815 kg	11.6 lb.	9.35 oz.
0.8 oz.	11.4 g	0.06 kg

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PCM 12

Writing Division Problems

Write and solve a division problem for each question.

1. **A board is 6 meters long.**

   a. If the board is divided into 15 equal-sized pieces, how long is each piece?

   b. If the board is divided into pieces that are 0.15 meter long, how many pieces do you get?

a. b.

2. **Another board is 0.6 meter long.**

   a. If the board is divided into 15 equal-sized pieces, how long is each piece?

   b. If the board is divided into pieces that are 0.15 meter long, how many pieces do you get?

a. b.

3. **A board is 12 meters long.**

   a. If the board is divided into 18 equal-sized pieces, how long is each piece? (Round to the nearest hundredth.)

   b. If the board is divided into pieces that are 0.18 meter long, how many pieces do you get? (Round to the nearest tenth.)

a. b.

4. **Another board is 1.2 meters long.**

   a. If the board is divided into 18 equal-sized pieces, how long is each piece? (Round to the nearest thousandth.)

   b. If the board is divided into pieces that are 0.18 meter long, how many pieces do you get? (Round to the nearest tenth.)

a. b.

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Measuring Practice

Use a metric ruler to solve the problems.

1. Measure the length and width, in centimeters, of the rectangle around questions 1–4. Then find the area of the rectangle. $A = l \times w$

   length = _____ centimeters

   width = _____ centimeters

   area = _____ square centimeters

2. You are planning to make yourself a pair of leather mittens. As a start, use the back of this sheet and draw the smallest rectangle that your hand will fit into. Measure the length and width of the rectangle in centimeters, and calculate the area of the rectangle.

   length = _____ centimeters

   width = _____ centimeters

   area = _____ square centimeters

3. As an art project, you are going to cover the front of a magazine with 1-centimeter squares. Select a magazine. Find the length and width of its cover in centimeters, then calculate the area of the cover.

   magazine: _____

   length = _____ centimeters

   width = _____ centimeters

   area = _____ square centimeters

4. Select a book. Using the centimeter ruler, find the length and width of the front cover, the binding, and the back cover. What is the total area of the outside of the book?

   area = _____ square centimeters

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PCM 14

Golden Anniversary

The 6 adult children of the Florenga family are throwing a gala party for their parents' 50th wedding anniversary. Here are the expenses:

Fiftieth Wedding Anniversary Expenses	
1. music	$ 600
2. banquet hall and food	2,800
3. full day in beauty salon for Mrs. Florenga	350
4. flowers, centerpieces	240
5. limousine service for the family	235
6. bartender, champagne	675
7. video photographer	300
8. final video	350
total	

Write arithmetic expressions for each scenario.

Scenario 1

The florists, longtime neighbors of the Florengas, asked if they could provide the flowers and centerpieces for free, as their gift. The 6 children would split the rest of the costs. What is each child's share? Explain your steps.

Scenario 2

The youngest of the children, a video artist, is taking care of expenses 7 and 8. The second oldest, who earns the most money, volunteered to pay for all of expense 2. The other 4 children will split the remaining costs. How much will each person pay? Explain your steps.

Scenario 3

After agreeing to follow scenario 2, the second-youngest child lost her job and everyone agreed she did not have to help pay. Calculate how much each child's share will be if

a. the other 3 children divide all expenses except 2, 7, and 8.

b. the neighbors provide the flowers and centerpieces for free, and the other 3 children split the remaining costs except 2, 7, and 8.

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PCM 15

Card Deck #2

Cut out these cards and initial the back of each one.

$\frac{0}{6}$	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$
$\frac{4}{6}$	$\frac{5}{6}$	$\frac{6}{6}$	$\frac{0}{7}$
$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{4}{7}$
$\frac{5}{7}$	$\frac{6}{7}$	$\frac{7}{7}$	

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Mileage and Miles per Gallon

Cut Slot

Gallons of Gasoline Used

CUT OUT WINDOW

Odometer Readings

Cut Slot

Odometer Readings	Gallons of Gasoline Used
27,435.3	
27,545.7	5.75
27,660.4	6.33
27,766.8	7.05
27,877.0	6.83
27,995.9	5.21
28,113.1	7.03
28,228.5	7.62
28,336.7	5.41
28,457.3	6.98
28,574.0	6.32
28,696.9	7.08
28,797.5	8.05
28,926.4	6.54
29,043.3	6.20

Cut along line.

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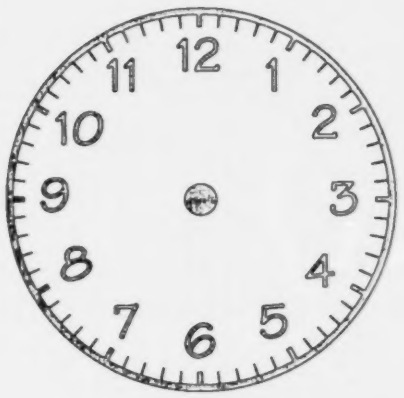
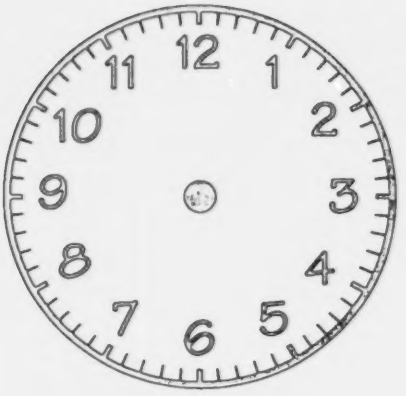
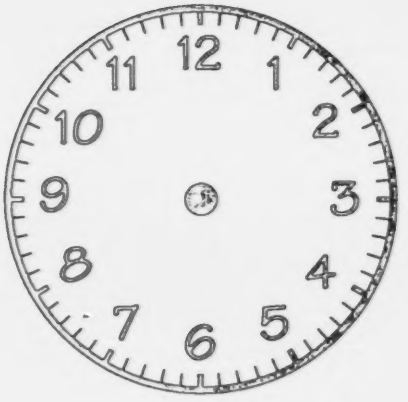
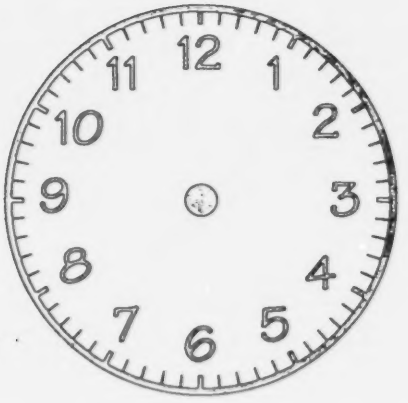
PCM 17

Clocks









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PCM 18

Extra! Extra!

Situation A. A clothing store sells shirts, pants, and jackets.

Question	Necessary Information	Extra Information
Example: How much does it cost for 5 shirts and 3 jackets?	Shirts cost $22.50 each and jackets cost $32 each.	The shirts come in sizes S, M, L, XL; the jackets are gray, blue, or red.

Situation B. A family went to the grocery store.

Question	Necessary Information	Extra Information

Situation C. In a city, a dog walker walks all the dogs in several apartment buildings.

Question	Necessary Information	Extra Information

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Adding Mixed Numbers

	A. $17\frac{3}{4} + 8\frac{2}{3}$	B. $25\frac{3}{8} + 10\frac{4}{5}$	C. $6\frac{4}{9} + 107\frac{1}{6}$
1. Do the fractions have the same denominators?	yes no	yes no	yes no
1a. If *no*, find a common denominator and rewrite the numerators.			
2. Find the sum of the fractions.			
2a. Can you simplify the sum of the fractions?	yes no	yes no	yes no
2b. If *yes*, write the fraction in lowest terms.			
3. Is the sum of the fractions greater than or equal to 1?	yes no	yes no	yes no
3a. Find the sum of all the whole numbers and write it here.			
4. Combine the sum of the whole numbers with the remaining fraction to find the sum of the original mixed numbers.			

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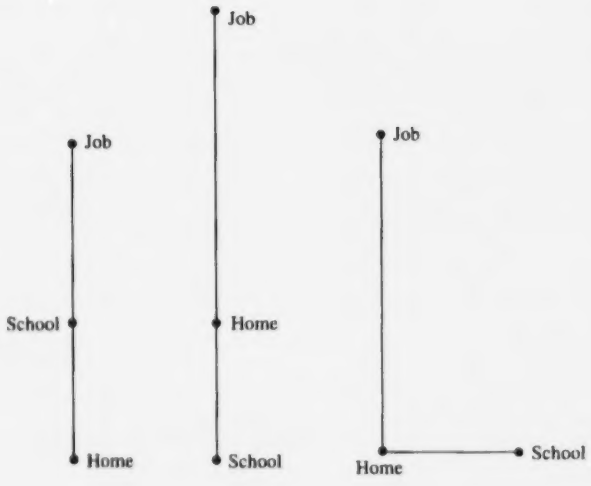
PCM 20

How Close? How Far?

1. Your job is $5\frac{3}{4}$ miles away from your home, and your school is $2\frac{1}{2}$ miles from your home. Fill in the numbers on the diagrams at the right, and find the maximum and minimum travel distances between your school and your job.

Maximum _____

Minimum _____



2. One of your uncles lives $10\frac{2}{3}$ miles from your apartment, and your grandmother lives $5\frac{5}{8}$ miles from your apartment. Draw and label three diagrams, like those for question 1. Find the maximum and minimum travel distances between those two relatives.

Maximum _____

Minimum _____

3. Make up your own maximum and minimum problem. Draw two or three diagrams, and find the maximum and minimum distances for your problem.

Maximum _____

Minimum _____

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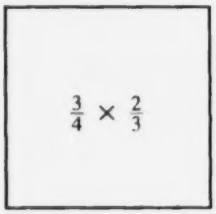
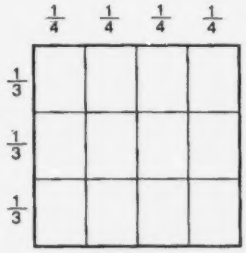
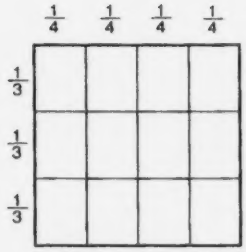
PCM 21

Multiplying Fractions





Step 1



Steps 2 and 3

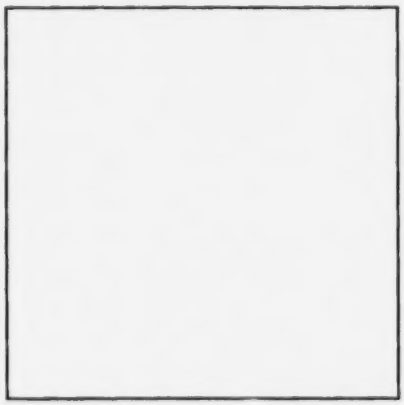
Step 1. The two denominators are 4 and 3. Divide one side of the square into fourths and label each segment $\frac{1}{4}$. Divide the other side of the square into thirds and label each segment $\frac{1}{3}$.

Step 2. The numerator for $\frac{3}{4}$ is 3, so you will be shading 3 of the 4 boxes in some of the rows. But how many rows will you shade? The numerator for $\frac{2}{3}$ is 2, so you will shade two rows.

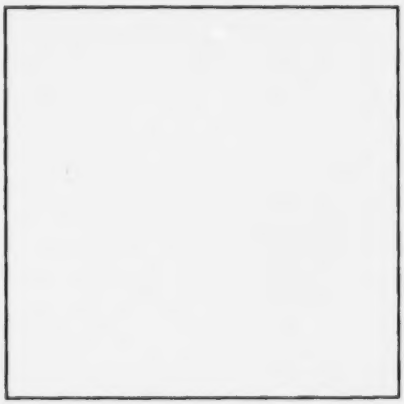
Step 3. The whole square has 12 boxes, so each little rectangle is $\frac{1}{12}$. Six little rectangles are shaded, so $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$.

Simplify: $\frac{6}{12} = \frac{1}{2}$

Use these squares to illustrate the product of each multiplication problem below.



$\frac{2}{5} \times \frac{5}{6} =$ _____



$\frac{1}{5} \times \frac{3}{4} =$ _____

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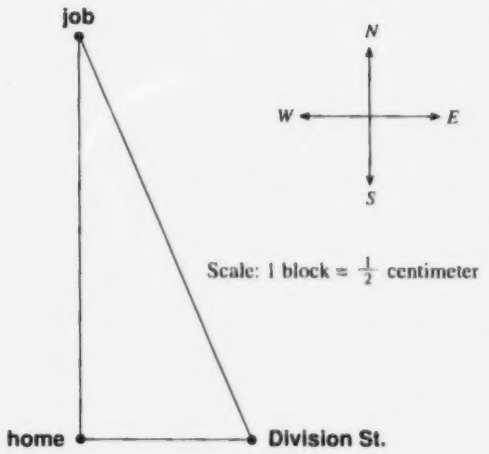
Drawing a Picture

1. Division Street is 5 blocks east of your home. Your job is 12 blocks north of your home. Label the distances on the scale drawing at right. Then measure the diagonal distance between Division Street and your job.



2. You left home, bicycled 8 miles north on a straight road, then turned west onto a straight path and went another 6 miles. Draw and label a scale drawing. Measure the diagonal distance between your home and the spot to which you rode.
Scale: 1 mile = $\frac{1}{2}$ centimeter

3. A bee left its hive and flew 1,600 feet south, then turned around and flew 100 feet north. Then the bee flew 800 feet west. Draw and label a scale drawing. Use it to find the diagonal distance between the hive and the bee's location.
Scale: 100 feet = $\frac{1}{2}$ centimeter

4. Make up your own distance problem. Then make a scale drawing and answer the problem.

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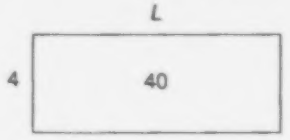
PCM 23

Picturing Equations #2

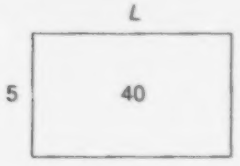
Equations

1. Anna has 40 square paving tiles to make a patio. She can make a patio 4 squares wide or 5 squares wide. How long would each patio be?



$4 \times L = 40$

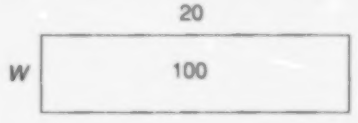
$\frac{40}{4} = L$

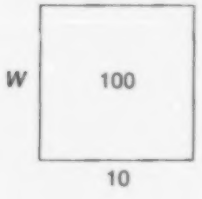


$5 \times L = 40$

$\frac{40}{5} = L$

2. Henrietta has 100 square paving tiles to make a patio. She can make a patio 20 squares long or 10 squares long. How wide would each patio be? Write a multiplication and a division equation for each patio.





3. Make up a problem like questions 1 and 2. Draw two diagrams, and write a multiplication problem and a division problem for each diagram.

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PCM 24

Circle Graphs

Carefully cut out the protractor at the bottom of this sheet.

1. You just received a $360 tax refund. On a separate sheet of paper, list how you plan to spend that $360. (You should have at least five items on your list.) Then use the protractor to make a circle graph for your items.

Total: $360

Total: $100

2. At an amusement park, you spent exactly $100 on the following:

parking	_____	games	_____
entrance fees	_____	food	_____
rides	_____	souvenirs	_____

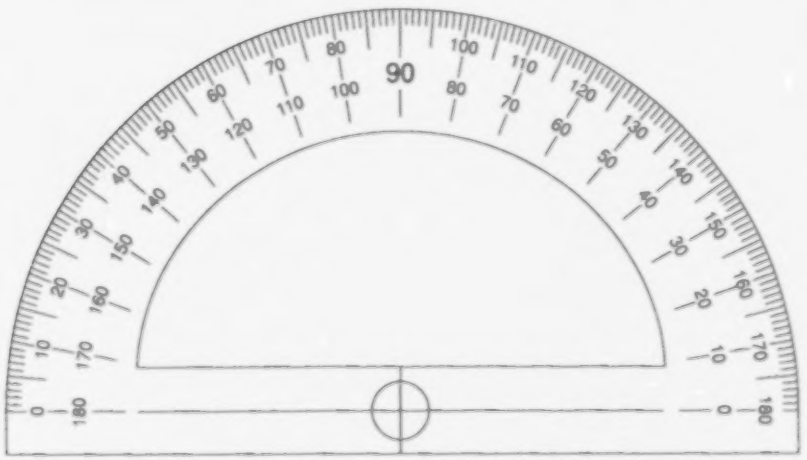
Total: $100

Make up costs for the six items that add up to exactly $100. Then show the six amounts in a circle graph.

3. Make up your own list of four to six items and find the total cost. Represent the individual costs in a circle graph.

Total: _____

Total: $_____



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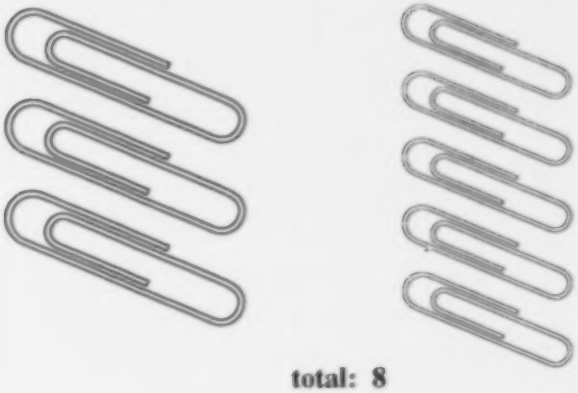
PCM 25

Writing a Ratio

Part 1

Object A: large paper clip **Object B: small paper clip**



total: 8

1. A to B _____
2. A to total _____
3. B to A _____
4. B to total _____
5. total to A _____
6. total to B _____

Part 2

Use paper clips or other items to represent object A and object B.

	Situation 1	Situation 2	Situation 3	Situation 4
1. A to B	6 to 4			
2. A to total				
3. B to A				
4. B to total			3 to 4	
5. total to A		13 to 4		
6. total to B				12 to 5

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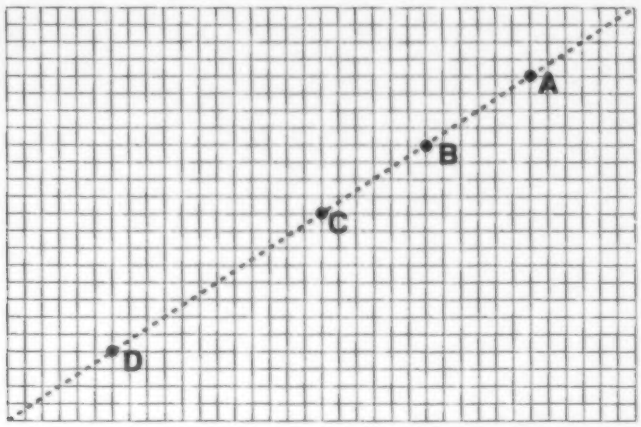
PCM 26

Understanding Proportion



1. Measure the length and width of the large rectangle, in squares. Write the ratio of the length to the width.	$\frac{\text{length}}{\text{width}} = \frac{36}{24}$
2. At point A, draw a horizontal line to the left and a vertical line down to form a new rectangle. Measure the length and width of rectangle A. Write the ratio of the length to the width.	Rectangle A $\frac{\text{length}}{\text{width}} \doteq$
3. Draw horizontal and vertical lines to form new rectangles from points B, C, and D. Measure the length and width of each rectangle, and write each $\frac{\text{length}}{\text{width}}$ ratio on the right.	Rectangle B: Rectangle C: Rectangle D:
4. Find the cross products of the ratios for rectangles A and B. Are rectangles A and B proportional?	yes no
5. Find the cross products for rectangles B and C; rectangles C and D; and rectangles A and D. Is each pair of rectangles proportional?	yes no

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PCM 27

Where Are We?

Part 1

Two locations on map	Distance between them on map (inches)	Actual distance between them (miles)
A. _____ B. _____		
A. _____ B. _____		
A. _____ B. _____		

Part 2

Two locations on map	Directions from A to B	Driving distance between the two locations
A. _____ B. _____		

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Card Deck #3

Cut out these cards and initial the back of each one.

25%	.25	.250	25.0%
2.5	2.50	250%	250.0%
$2\frac{1}{2}\%$	.025	2.5%	.0250
10%	50%	.10	.50

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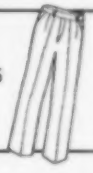
PCM 29

Make Up the Question

	Item	Percent Off	Original Price	Savings	Sale Price
1	turtleneck	35%			
2	socks	35%			
3	slacks 		$29.00		
4	button-down shirt	25%			
5	flannel shirt		$19.00		
6	T-shirt				
7	blue jeans				
8	scarf and hat set				
9	bathrobe				
10	sweater				

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PCM 30

Solving a Percent Equation

1. **Use large and small paper clips to write and solve each equation.**

Example:
12 large clips
10 small clips

a. What percent of the number of large clips is the number of small clips?

$\% = \frac{10}{12} = 83\%$

b. What percent of the number of small clips is the number of large clips?

$\% = \frac{12}{10} = 120\%$

c. What percent of the number of large clips is the total number of paper clips?

$\% = \frac{22}{12} = 183\%$

d. What percent of the number of small clips is the total number of paper clips?

$\% = \frac{22}{10} = 220\%$

e. What percent of the total number of paper clips is the number of large clips?

$\% = \frac{12}{22} = 55\%$

f. What percent of the total number of paper clips is the number of small clips?

$\% = \frac{10}{22} = 45\%$

2. **In the six equations above, sometimes the percent is more than 100% and sometimes it is less than 100%. How can you tell, before you solve the percent equation, if the percent will be more than 100%?**

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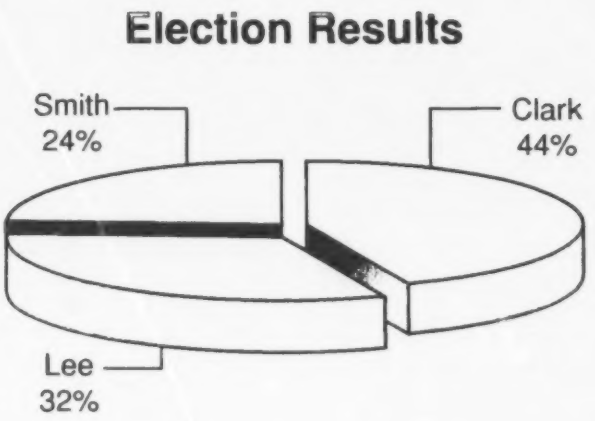
PCM 31

Making Sense of Data

Solve the following problems. Record your answers in five-column grids.

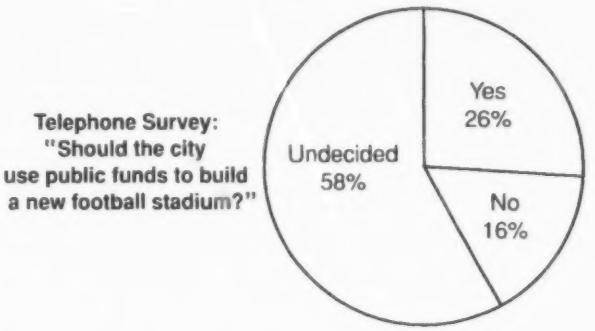
If 4,000 people voted in the election, how many voted for

1. Smith?
2. Clark?
3. Lee?



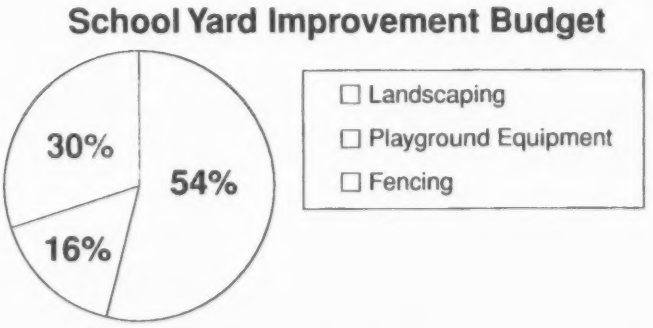
If 500 people answered the survey, how many

4. said *Yes?*
5. said *No?*
6. were undecided?



If the total budget is $30,000, how many dollars will be spent on

7. fencing?
8. playground equipment?
9. landscaping?



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Two-Step Percent Problems

Fill in the dollar amounts for each transaction in shopping trip 1.

	Shopping Trip 1 *Example:*	Shopping Trip 2	Shopping Trip 3	Shopping Trip 4
Total cost of items	$175			
Deck 1	$15 off			
Deck 2	$\frac{1}{5}$ added discount			
Deck 3	8% tax			
Final cost				

Fill in shopping trips 2, 3, and 4 in the chart as follows:

Step 1. Select a total cost between $100 and $500, and write it in the first row.

Step 2. Draw one card from Deck 1, one from Deck 2, and one from Deck 3. Write the values in the correct rows.

Step 3. Find your cost at each step and your final cost.

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PCM 33

Finding Discounts

Calculate the sale price for each item.

Item	Original Price	Discount	Sale Price
shoes	$65.50	15%	
shoes	$59.60	20%	
shoes	$55.00	20%	
shoes	$62.75	$15.00	
slacks	$29.50	25%	
slacks	$33.75	$7.00	
slacks	$35.00	30%	
slacks	$27.00	10%	

Item	Original Price	Discount	Sale Price
shirt	$17.50	25%	
shirt	$19.75	$5.00	
shirt	$21.00	35%	
shirt	$25.00	20%	
sweater	$65.00	10%	
sweater	$75.00	15%	
sweater	$72.50	$10.00	
sweater	$79.95	20%	

Now select one complete outfit (shoes, slacks, shirt, sweater) so the total cost of the outfit is less than $150.

Item	Original Price	Sale Price
shoes		
slacks		
shirt		
sweater		
total		

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Answer Key

Answers not given within the *TRG* activity pages are given here.

PCM 8: Reimbursing a Property Manager

Activity: Reimbursing a Property Manager

Total expenses: $298.40

Property 1: $70.39

Property 2: $159.71

Property 3: $68.30

Activity: How Close to Last Month?

Property 1: $12.16 less than last month

Property 2: $14.32 less than last month

Property 3: $17.40 more than last month

PCM 9: Picturing Equations #1

3. $p + 10 = 38$
$10 + p = 38$
$38 - 10 = p$
$38 - p = 10$

4. $148 + 37 = g$
$37 + 148 = g$
$g - 37 = 148$
$g - 148 = 37$

5. $t + 17 = 29$
$17 + t = 29$
$29 - t = 17$
$29 - 17 = t$

6. $5 + 16 = w$
$16 + 5 = w$
$w - 5 = 16$
$w - 16 = 5$

PCM 10: Finding the Balance

	Property 1		Property 2		Property 3	
	Charges	Total	Charges	Total	Charges	Total
		1,000.00		1,000.00		1,000.00
Jan.	56.95	943.05	0.00	1,000.00	39.99	960.01
Feb.	88.25	854.80	125.00	875.00	0.00	960.01
Mar.	50.00	804.80	50.00	825.00	50.00	910.01
Apr.	50.00	754.80	50.00	775.00	50.00	860.01
May	251.40	503.40	78.99	696.01	251.40	608.61
June	0.00	503.40	56.95	639.06	78.99	529.62
July	39.99	463.41	82.55	556.51	0.00	529.62
Aug.	125.00	338.41	12.29	544.22	70.39	459.23
Sept.	0.00	338.41	12.29	531.93	56.95	402.28
Oct.	78.99	259.42	39.99	491.94	174.03	228.25
Nov.	82.55	176.87	174.03	317.91	50.90	177.35
Dec.	70.39	106.48	159.71	158.20	68.30	109.05
FINAL BALANCE		106.48		158.20		109.05

PCM 12: Writing Division Problems

1. a. .4 meter

$$15\overline{)6.0}$$

b. 40 pieces

$$.15\overline{)6} \rightarrow 15.\overline{)600}$$

2. a. .04 meter

$$15\overline{).60}$$

b. 4 pieces

$$.15\overline{).60} \rightarrow 15\overline{)60}$$

3. a. .67 meter

$$18\overline{)12.000}$$

b. 66.7 pieces

$$.18\overline{)12} \rightarrow 18.\overline{)1200.00}$$

4. a. .067 meter

$$18\overline{)1.2000}$$

b. 6.7 pieces

$$.18\overline{)1.2} \rightarrow 18.\overline{)120.00}$$

PCM 14: Golden Anniversary

Answers are based on the total cost of $5,550.

1. $885 each
$(5{,}550 - 240) \div 6 = 885$

2. youngest child: $650; second oldest: $2,800; other 4 children: $525 each $(5{,}550 - 300 - 350 - 2{,}800) \div 4 = 525$

3a. youngest: $650; second oldest: $2,800; other 3 children: $700 $(5{,}550 - 2{,}800 - 300 - 350) \div 3 = 700$

3b. youngest: $650; second oldest: $2,800; other 3 children: $620 $(5{,}550 - 2{,}800 - 300 - 350 - 240) \div 3 = 620$

PCM 16: Mileage and Miles per Gallon

Length of Trip	*Gallons of Gasoline*	*Miles per Gallon*
110.4	5.75	19.2
114.7	6.33	18.1
106.4	7.05	15.1
110.2	6.83	16.1
118.9	5.21	22.8
117.2	7.03	16.7
115.4	7.62	15.1
108.2	5.41	20.0
120.6	6.98	17.3
116.7	6.32	18.5
122.9	7.08	17.4
100.6	8.05	12.5
128.9	6.54	19.7
116.9	6.20	18.9

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PCM 19: Adding Mixed Numbers

A.	B.	C.
1. no	1. no	1. no
1a. $\frac{9}{12}$ $\frac{8}{12}$	1a. $\frac{15}{40}$ $\frac{32}{40}$	1a. $\frac{8}{18}$ $\frac{3}{18}$
2. $\frac{17}{12}$	2. $\frac{47}{40}$	2. $\frac{11}{18}$
2a. yes	2a. yes	2a. no
2b. $1\frac{5}{12}$	2b. $1\frac{7}{40}$	3. no
3. yes	3. yes	3a. 113
3a. 26	3a. 36	4. $113\frac{11}{18}$
4. $26\frac{5}{12}$	4. $36\frac{7}{40}$	

PCM 20: How Close? How Far?

1. maximum: $8\frac{1}{4}$ miles
   minimum: $3\frac{1}{4}$ miles
2. maximum: $16\frac{7}{24}$ miles
   minimum: $5\frac{1}{24}$ miles
3. Answers will vary.

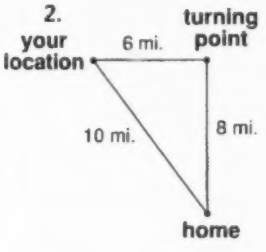
PCM 21: Multiplying Fractions

$\frac{2}{5} \times \frac{5}{6} = \frac{1}{3}$ $\frac{1}{5} \times \frac{3}{4} = \frac{3}{20}$

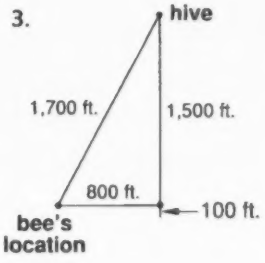
PCM 22: Drawing a Picture

1. 13 blocks

2.



3.



4. Answers will vary.

PCM 23: Picturing Equations #2

1. patio 4 squares wide will be 10 squares long
   patio 5 squares wide will be 8 squares long
2. patio 20 squares long will be 5 squares wide
   patio 10 squares long will be 10 squares wide
3. Answers will vary.

PCM 25: Writing a Ratio

Part 1

1. 3 to 5
2. 3 to 8
3. 5 to 3
4. 5 to 8
5. 8 to 3
6. 8 to 5

Part 2

	Situation 1	Situation 2	Situation 3	Situation 4
1. A to B	6 to 4	4 to 9	1 to 3	7 to 5
2. A to total	6 to 10	4 to 13	1 to 4	7 to 12
3. B to A	4 to 6	9 to 4	3 to 1	5 to 7
4. B to total	4 to 10	9 to 13	3 to 4	5 to 12
5. total to A	10 to 6	13 to 4	4 to 1	12 to 7
6. total to B	10 to 4	13 to 9	4 to 3	12 to 5

PCM 26: Understanding Proportion

1. $\frac{36}{24}$
2. rectangle A: $\frac{30}{20}$
3. rectangle B: $\frac{24}{16}$
   rectangle C: $\frac{18}{12}$
   rectangle D: $\frac{6}{4}$
4. yes
5. yes

PCM 30: Solving a Percent Equation

1. Equations will vary.
2. If the part is greater than the whole, the percent will be greater than 100%.

PCM 31: Making Sense of Data

1. 960
2. 1,760
3. 1,280
4. 130
5. 80
6. 290
7. $4,800
8. $16,200
9. $9,000

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PCM 33: Finding Discounts

Item	Original Price	Discount	Sale Price
shoes	$65.50	15%	$55.68
shoes	$59.60	20%	$47.68
shoes	$55.00	20%	$44.00
shoes	$62.75	$15.00	$47.75
slacks	$29.50	25%	$22.13
slacks	$33.75	$7.00	$26.75
slacks	$35.00	30%	$24.50
slacks	$27.00	10%	$24.30

Item	Original Price	Discount	Sale Price
shirt	$17.50	25%	$13.13
shirt	$19.75	$5.00	$14.75
shirt	$21.00	35%	$13.65
shirt	$25.00	20%	$20.00
sweater	$65.00	10%	$58.50
sweater	$75.00	15%	$63.75
sweater	$72.50	$10.00	$62.50
sweater	$79.95	20%	$63.96

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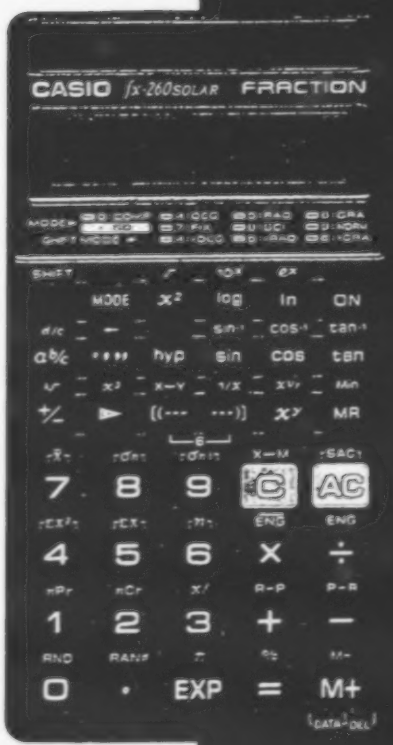

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